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Musk Deer in Nandadevi Sanctuary.

— Photo by Anup Shah



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Honorary Secretary.

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The Tiger is Saved ?

India is making determined attempts at saving the fast vanishing tiger—the most beautiful of the larger wild cats. The tiger continues to be shot, trapped and poisoned for its fur which is still in great demand in some countries and greed for money prompts men to acquire and export tiger skins illegally, risking fine and even imprisonment.

Dr. Karan Singh, Chairman, Indian Board of Wildlife, Government of India launched 'Project Tiger' on April 1, 1973 at Dhikala in Corbett National Park—and a Directorate, headed by Shri K.S. Sankhala has been established in the Ministry of Agriculture. A sum of more than rupees four crores has been allocated by the Government of India for six years and the World Wildlife Fund has contributed a million dollars in addition.

The first year was taken up with complex negotiations with State Governments who have Forests and Wildlife to look after and exploit under the Indian Constitution.

Nine tiger reserves have been declared:—

MANAS	...	ASSAM
PALAMAU	...	BIHAR
SIMLIPAL NATIONAL PARK	...	ORISSA
CORBETT NATIONAL PARK	...	UTTAR PRADESH
RANTHANBHOR	...	RAJASTHAN
KANHA NATIONAL PARK	...	MADHYA PRADESH
MELAGHAT	...	MAHARASHTRA
BANDIPUR	...	KARNATAKA
SUNDERBAN	...	WEST BENGAL

In addition the tiger is protected throughout India under the Wildlife Protections Act 1972.

The World Wildlife Fund and the I.U.C.N. have donated 25 vehicles; two jet speed boats for Sunderban, two camels for Ranthanbhor, radio networks, cameras, slide projectors, guns, binoculars, books and periodicals. Voluntary organisation in the field in India like the Wildlife Preservation Society of India and the Bombay Natural History Society have been rendering material technical and moral support wherever possible.

Detailed management plans were drawn up by Indian authorities. Dr. Duncan Poore and Dr. Colin Holloway spent three weeks in the field holding consultations.

In March 1976 an assessment of the progress was undertaken by a leading Indian Scientist and experts from I.U.C.N. and W.W.F. Their recommendations are awaited.

In April 1976 Dr. David Mech and Dr. Ulysses S. Seal, specialists in animal trapping, tranquilisation and telemetry gave a course of lectures and practical demonstration at the Forest Research Institute and Colleges, Dehra Dun and in the field in Chila, Bharatpur and Ranthambhor.

Tiger population in tiger reserves is reported to have increased and most reserves are carrying their full capacity. Poaching has declined but still continues as the discoveries of fresh tiger skins in Delhi and Calcutta by the Wildlife Staff shows.

In some National Parks (e.g. Kanha) villages have been shifted to land outside, fire watch towers and guard posts have been built and radio networks are being installed.

Nepal: Tiger reserves have been established in Royal Chitwan National Park, the Royal Karnali Wildlife Reserve and the Royal Shukla Phauta Wildlife Reserve. Nepal Government's National Parks and Wildlife Conservation Department administers the reserves with the assistance of FAO/UNDP. Under Project No. 1051 an ecological study of the tiger using telemetry is now in its third year under the management of Smithsonian Institution (U.S.A.).

Bangladesh: Bangladesh gives legal protection to tiger.

Indonesia: In Indonesia only a dozen javan tigers are supposed to survive. A survey in 1975 indicates that about 800 Sumatran tigers survive and a hundred are killed each year in spite of legal protection.

Thailand: A WWF/IUCN conservation programme for 1976-77 covers the Indo-Chinese tiger in the KHAO YAI National Park and other reserves.

Turkey: In 1976 WWF/IUCN will carry out a status survey of the caspian Tiger in Eastern Turkey where some have been shot recently.

Iran: Department of Environmental conservation has not come across any conclusive proof of presence of tigers.

Operation Gharial

(The second of two articles on the Gharial)

DR. H.R. BUSTARD

In the first of these articles the present status of the gharial and reasons for its decline were summarised. Several states showed interest in gharial conservation by means of active management schemes with financial assistance from Government of India and technical assistance from F.A.O./U.N.D.P. The first scheme to receive sanction and get underway was the Orissa State Scheme which envisaged a total expenditure of Rs. 20 lakh during the First Five Year period and covered all three species of Indian crocodilians (all of which occur in the state). Satkosia gorge, Mahanadi river, was chosen as field location for the gharial sub-scheme. A gharial scheme was also sanctioned for Uttar Pradesh in September 1975 and it is probable that one will also commence in Rajasthan.

'Operation Gharial' like operation tiger, aims to save the gharial from extinction by bringing about its rehabilitation in certain ideal habitats where gharial were formerly numerous. There is, however, no national project with this title nor are there national staff. Instead Government of India has recruited a crocodile expert through F.A.O./U.N.D.P. and made him available to the States to initiate and develop a corpus of work on corcodile conservation. The writer is F.A.O. Consultant/Crocodile Farming/Government of India.

It may not be possible to save the gharial—now reduced to pockets of only a few individuals in favoured locations—by mere protection, a method which would anyway be extremely time consuming. An active management programme has been selected. The Orissa activities are typical of what will be attempted in other States.

Selection of management area

This must be an area in which gharial can be effectively protected. This consideration must take precedence over all others. The habitat must have a secure future—an area scheduled for dam construction would not be suitable. It is surprising how few unspoilt riverine areas remain in India.

In order to exert some level of control over the habitat the area should be gazetted a sanctuary with a longer term view of upgrading it to National Park status. The chosen area must be one in which gharials were formerly abundant that is to say it must be ideal gharial habitat.

Satkosia gorge, Mahanadi river, Orissa satisfies all these criteria. The fourteen mile stretch of river within the gorge contains deep pools in the dry season. The river is sizeable (providing a large area of habitat) without being unmanageably so. The low human

population makes management easier (only 400 families inhabit the entire gorge and are grouped in villages towards both ends). The area is scenically superb, the hills clothed in virgin sal-bamboo forests, and due to poor road communication with the nearest centre—Angul, 36 miles distant—has seen extremely little disturbance.

Satkosia Gorge Sanctuary will shortly be declared. It will include 17 miles of rivers in its 250 sq. mile area. The area has already been declared as one of special tourism development by the State Government and the project is trying to include tourism in its management activities so as to reduce its impact to the gorge and the gharials. This will be possible by streaming tourists away from the gorge itself as a result of developing other features of the sanctuary and drastically reducing access to the gorge waters. Thus as I wrote in a report to Government 'People should be enabled to visit the gorge to see its treasures, to *visit* and *see* but not to *use* the gorge'.

Management of the gharials

This must include complete protection of the remaining gharials. There are now 4 adults (2 pairs) in Satkosia gorge. There are no juveniles or subadults. The males are about 14-15 feet and 17-19 feet and the females about 14-15 and 10-11 feet. Two gharial guards were posted in April, 1974 by the Orissa Forest Department which showed great presence of mind by anticipating the initiation of the scheme by twelve months. Two additional guards were posted in April, 1975. The scheme was extremely fortunate in being able to recruit local fishermen with an intimate knowledge of the gorge who maintain a detailed watch on the gharial. Despite intensive poaching immediately outside the gorge the 4 gharials within the gorge have remained secure.

Crocodylian eggs and young crocodilians undergo very high levels of predation. Although female gharials typically guard the nest this trait has broken down under the intensity of set-netting (stretching nylon gill-nets across the river). The gharial fear the nets and move up and down river in order to avoid them hence nest guarding is impossible. Apart from monitor lizards (*Varanus*), wild boar, and jackals 'traditional' predators also include the Munda tribals who formerly specialised in crocodile egg eating (their place in Nepal is occupied by *Tharus*—lethal enemies of gharial eggs since they skilfully locate and eat every nest). Hence management includes removal of each clutch of eggs to a safe hatchery for incubation as soon as the eggs are laid.

The hatchery provides no artificial heat, indeed it requires good shade from the fierce heat of the Orissa summer. A constant temperature of round 33°C is maintained by addition of water to the artificial nest mounds, contained within an open (unmortared) brick framework so that the sand mound can evaporate water like an unglazed earthenware pot.

Young crocodiles also have many enemies and are small virtually defenceless creatures. They should be captive-reared until about one metre in length, before being 're-seeded' into the natural habitat.

The author returned to India on 1st April, 1975 and through courtesy and help provided by that keen Indian naturalist and gharial enthusiast Sri S P. Shahi, I.F.S., who retired this year as Chief Conservator of Forests, Bihar, was able to collect two clutches of eggs from the Gandak river and bring most of the eggs to Orissa. Forty-two eggs hatched between 18 and 21st June, 1975. In the ideal hatchling pool complexes designed by the Consultant and built by the Orissa Forest Department, they have thrived and at three months old there have been only three mortalities. The gharials have increased from 35 cm size at birth to as much as 0.6 m with a weight increase from an average of under 100 grams to 300 grams or more. They are fed entirely on small live fishes—mixed species from the Mahanadi.

Young will be seeded into the gorge in the dry season when they reach a suitable size. This must be done during the dry season so that they are able to establish themselves and obtain a detailed knowledge of the habitat prior to the monsoonal floods. When the river is in spate gharials move with the fish into side nalas where the water flow remains sluggish.

It is expected that first breeding will take place at an age of about nine years but it may occur even earlier.

Gharial natural history

The extreme fecundity of the gharial, like other crocodilians, makes it ideal for management. Large natural mortalities can be eliminated by good captive husbandry conditions. Hence in the first year thirty-nine Gandak gharials have been reared together with part of a batch of twenty U.P. gharials.

Gharials lay more eggs as the breeding female increases in size (and, therefore, age) to a maximum of 60-70 eggs in a clutch. One clutch is laid each year. Nests are dug in high sandbanks to avoid flooding. Water level fluctuations during incubation are a hazard even though nesting is timed to permit hatching prior to the first floods because of the habitat in snow-fed rivers rising in the Himalayas. Egg laying usually occurs in April and incubation takes between two and three months depending on temperature.

Although gharials eat fish almost exclusively they do not appear to be harmful to a fishery. On the contrary it appears that their presence may even be beneficial as they eat mainly coarse fish of low human palatability which are themselves predators of eggs, fry and fingerlings of important commercial fish species.

Wild breeding at present

When a species become critically depleted in numbers wild breeding frequently suffers and may even cease. This appears to be the situation facing the gharial in parts of its range today. At Satkosia gorge in 1975 only one nest of eggs is known to have been laid (by the two females). It is assumed, since hatchlings were not seen either, that the second female did not breed this year though evidence of breeding in former years exists. The first smaller female, laid twenty five eggs which were collected immediately after nesting was completed. The eggs all proved infertile. Hence the gorge produced no young during 1975 whereas in 1974 at least thirty hatchlings are known to have been produced.

Similarly a female gharial in Phawat Bhata (Chambal river, Rajasthan) known to have bred successfully in 1973 and 1974 prepared a nest but did not lay in 1975. I saw this female with her 35 young on 5 occasions during July, 1974. Few people know that the mother gharial protects the young as well as the eggs.

The future

Gharials have considerable tourist potential. In a world where every thing must pay its way, this may be important in ensuring their future following rehabilitation. Poaching will remain an ever present problem. It must be controlled—kept within acceptable limits. There is also the possibility of selective culling. This could produce substantial revenue and if local people were widely involved in the scheme would greatly assist in the conservation of the gharial as well as providing much needed local employment. This is because it is impossible for poachers to operate without the knowledge of the local villagers.

Hence it may be possible to protect a critically endangered crocodilian and earn much needed foreign exchange at the same time. This would be a further important reason for maintaining an adequate level of protection, so essential if this ancient crocodilian is to survive in its natural Indian habitat into the 21st century.

Animal Translocation as a Tool in Wildlife Management

By

P.D. STRACEY, I.F.S. (RETD.)

The translocation of wild animals has come to be recognised as an important tool in wildlife management. In Africa, the first large scale attempts at this almost unknown technique were when the Kariba dam was filling up in 1959, and it became necessary to remove large numbers of animals to safety. The massive rescue operations, financed by international conservation bodies, caught the imagination of the world.

The early attempts to capture and move large animals, like rhinoceroses, were necessarily based on the use of force. People who saw the film *Hatari* will recall the chasing and noosing of rhinos from vehicles, which had to be able to withstand the attacks of enraged animals. Injuries and casualties were necessarily unavoidable.

I recall the post-war efforts in Assam at capturing and transporting rhinoceroses for foreign zoos: the first attempts ended in severe injuries to the captured animals and in some cases death when we moved freshly caught animals in iron cages by train all the way to Calcutta, the first staging place on the journey from India. It was not until we adopted the holding-stockade, as in elephant catching, where the animal could be sufficiently tranquillised almost to the stage of tameness, that we eliminated casualties.

The South African conservationists have perfected the capture and translocation of wild animals to a fine art. Numbers of white (wide-lipped) rhino, threatened in certain areas, were successfully moved by them to safe localities after immobilisation. Since then they have discovered the use of a completely new method.

This consists of the use of cloth screens, which are put out as funnels over long distances and leading to a 'stockade' also made of cloth but reinforced by ordinary wire mesh. They found that animals when driven between such cloth walls do not attempt to break out, probably thinking that the screens are walls. The tiger hunting methods of the Nepal Kings employed ordinary white cloth strung on bushes to guide the tiger to the guns. Using this simple method, and with a helicopter for driving the animals into the trap, the South Africans found they could capture all manner of animals, from hartebeest to buffaloes. The movement to new localities was effected in trucks, into which the captured animals were herded.

Employing this method in May 1974 we captured and moved some 200 of the rare and vanishing antelope, called *Swayne's hartebeest*, within Ethiopia. This species, once numbered

in thousands in Somalia and south-eastern Ethiopia, has been reduced to a few hundred found in isolated pockets in southern Ethiopia. In Somalia it has disappeared.

Cattle-borne diseases

The cause of the decline of the once plentiful representative of the several races of hartebeest in Africa has been attributed to cattle-borne diseases which invaded east Africa nearly a hundred years ago. In this particular case, finding that the isolated population of hartebeest in a certain area that was coming under mechanised cultivation had no future, we decided to move them to one or other of the nearby parks.

It was a bold venture for the infant wildlife department of Ethiopia, particularly as we decided to do away with foreign aid. Using ordinary hessian instead of the grey plastic cloth employed by the South Africans and Landrover vehicles to drive the animals instead of helicopters, we successfully impounded and moved a number of Swayne's hartebeest to two widely separated parks, involving truck journeys of hundreds of kilometres.

There were some unavoidable casualties, particularly among the younger animals through having to keep the captured animals in the stockade for several days and because of overcrowding. But when one recalls the heavy mortality in blackbuck that were moved in open trucks from Agra to eastern U.P. some years ago the percentage of casualties was negligible. The secret was in completely covering all the trucks with tarpaulins to shut out daylight.

Another translocation job, though this time of a slightly different nature, was in respect of a dozen Somali Wild Ass, another rare species which is no longer to be found in the country of its name but which is still found in adjoining Ethiopia, though in much diminished numbers. An approach was made to the Ethiopian Wildlife Conservation Organization for permission to capture a dozen of these rare animals for captive breeding in the Catskill Game Farm of the United States, the fee offered being a hundred and fifty thousand dollars. The quota of animals was duly captured, the method in this case being to chase them in jeeps with a noose dangling at the end of a long pole. Care was taken to select only true wild ass and to avoid any traces of feral blood, the criterion being the least number of stripes on the flank of the animal.

Surprisingly enough the capture did not present much difficulty, the only danger to the wild ass being the exhaustion of the chase and to the handlers the tendency of the animals to bite. Zebras on the other hand tend to kick, but this the wild ass did not do. The animals were boxed in narrow crates and transferred to a corral, where they soon became docile.

At this stage a contretemps occurred: the blood tests, made in the United States, revealed the presence of *Equine pyrophasmosis* and the American health authorities refused to permit the importation of the animals into that country! Eventually Israel came forward to take them and the wild ass are alive and well and actually breeding in one of their sanctuaries in the desert, which the Israel authorities intend to restock with the animals that were there in Biblical times.

The time will come when India will have to utilise the modern wildlife management techniques of translocation and captive breeding to save threatened species and to restock areas. The capture and movement of large animals, particularly active animals like deer and antelope, present many difficulties. When large groups are to be moved the use of cloth screens, stockades and trucks will probably be the best. For other animals, like carnivora and wild buffalo the use of tranquillisers would be the best method.

A whole fund of experience has become available through the research and experiments of Dr. A.M. Harthoorn in East Africa. Using several drugs in a series of remarkable experiments he managed to tranquillise such large animals as elephant, rhinoceros and eland. Under such conditions of tranquillisation the bodily functions of wild animals could be studied. The pioneering work in immobilisation was done in 1958 in the United States using nicotine as the agent but since then there has been much progress.

Wild animals can now be caught, through immobilisation, by even less experienced persons, and in the safety margin that has been achieved the evolution of a reliable antidote to the immobilising compound has contributed much.

Export of India's Wild Life and its Biological Significance

By

R.K. BHANOTAR, R.K. BHATNAGAR AND D.K. THAKUR

(Continued from Cheetal, Vol. 16, No. 4)

Conclusion

Biological significance: From the export figures of monkeys it is seen that the average price these animals fetched, ranged between Rs. 47.80 to Rs. 101/- each. Such mass export even for biological and medical sciences may eventually reflect in the ecological implications which are being ignored.

Further, the average price fetched by birds are about Rs. 2.11. However, the average figures for 1969-70 in this respect falls down to 0.26 paise. Is it ecologically and economically sound? Some steps are necessary to stop this.

Regarding export of "feathers" of birds, it appears that no clear cut instructions are available and perhaps banned feathers are also being mixed up. This needs fresh policies to be formulated by experts. Similarly the items falling under "Zoological collection" need categorisation as under this heading several banned items might be under export.

In view of the above facts and figures, it is not surprising that within the last few decades, India's once abundant wildlife has diminished catastrophically. Ironically India has chosen her National insignia which includes lions, bull and a horse. The animals involved for their hides are the most effected. It was openly said abroad that the day may not be far off when the only place to find "Tiger" will be the Zoo only. It is now heartening to say that "Operation Tiger" launched recently by the Government of India will be a step for conservation. But can it be possible for a Government agency to do it alone. A well known Indian naturalist, Shri Arjan Singh, has rightly pointed out that "Wildlife does not seem to fit in well with the socialistic pattern of our society". He suggested, things might improve with determined lobbying by private citizen and by the development of wildlife tourism.

There appear to be bans and curbs on the killings of so many endangered species, but fur dealers in big cities in India still offer skins by the score and there appears to be no way to crackdown on these traders. It is essential that public opinion may be mobilised in support of efficient protection of what is an irreplaceable national heritage. In many rural areas, more particularly in drought prone and famine areas, protein intake is considerably augmented from wildlife sources and in certain areas (desert region) this may exceed 50 per cent of the meat consumed. Such exploitation is not considered criminal. The

authors have observed indiscriminate killing of *Uromastix* sp. for its meat and oil in desert region and its periphery. The herds of deer in Rajasthan desert present during 1950 have now been reduced to isolated pairs in 1970.

Lately the mammals of Himalayan region have become the target of exploitation. Unplanned rural expansion setting up of refineries and heavy industries are seriously threatening the population of several species which are further troubled in the pollution cycle. Tons of insecticides and liquid sprays used in anti-locust operations for the last many decades have definitely effected the desert fauna.

From the data given above it may be concluded that India with her varied rich and enormous wildlife fauna is exporting every year huge quantity of live animals and produce thereof. The percentage of export in all cases is rather on the higher side and on the increase. The given figures do not include the requirement for home consumption, which may be slightly less than the exported quantity, if not equal. The responsibility of the custodians of wildlife thus increases manifold. The smuggling of the wildlife produce of India being carried on through the neighbouring countries needs further strict checking.

It may be added that stricter control is necessary in case of such wildlife which may be fast dwindling in numbers such as leopard and tigers. The same holds good in the case of "natural musk" (Bhanotar & Bhatnagar, 1973).

Following suggestions are offered for better control preservation and management of wildlife:—

1. *Extension and Publicity*: The agency to undertake this is lacking in India. So far only amateurs with love for wildlife have played their role in a lonesome way. For general public professional hands are required for making interesting documentaries and feature films on various aspects of wildlife. Further suitable low priced brochures in regional languages should be brought out. For this suitable assignments may be given to relevant expertise. Thus brochures or documentaries on undermentioned aspects may be made and issued for the present.

(1) Vanishing and threatened animals of various regions.

(2) Why nature conservation is necessary?

(3) How conservation is practised for higher propagation?

The radio and visual (T.V.) media be exploited to fuller extent. Some aspects of wildlife in regional languages may invariably be included in programme for villagers and 'Krishi Darshan'. What is required is a "flood" of publicity and not a stray light hearted 'fill in gap' attempt. Expertise may be asked to broadcast in a suitable way depicting the local wildlife fauna, its beauty with a "sound" programmes as far as possible. Similarly with the expansion of T.V. network in the country, T.V. films on wildlife aspects be

prepared and shown extensively atleast twice a week. A relentless drive is necessary. A suitable post in the T.V. management for a wildlife expert with a camera unit is a necessity for the present. Needless to add that post of Wildlife Extension cum Publicity Officer be created in each State having National Parks and Wildlife Sanctuaries.

2. *Education:* This is perhaps a most vital and important part of nature conservation and most effective too. Unfortunately, not much emphasis has so far been made on this aspect. Rightly in his recent inaugural address in the 15th (1973) Annual General Meeting of the Wild Life Preservation Society of India, Shri K.L. Lahri I.F.S., Inspector General of Forests, expressed that "in the universities too, zoology course has a marked accent on domesticated animals, and at best on museum specimens. No study is generally encouraged for wildlife—its ecology and habitats. It is not the anatomy of a wildlife animal and its food habits, but the collective response of wildlife to its environment which should be a more fascinating study".

It is, therefore, suggested that teaching of natural history of wild animals and birds, their need for conservation be introduced in preliminary forms from class V onwards as a compulsory subject. Social awareness on the subject thus could be aroused from the beginning itself. For this purpose low priced booklets for children written by experts be brought out with the financial help from Governmenta gencies.

Wildlife Week, once a year at present held under Government agency, should also be shifted to all the Universities, colleges and schools right upto district, B.D.O. and village Panchayat level. It should be the involvement of all and not of few buttonholed bureaucrats.

For higher education: At University level a subject on wildlife and conservation may be introduced. A committee may be constituted to advice on the curriculum. Similarly courses on Wildlife at the Indian Forest Research Institute, Dehra Dun be opened to sponsored candidates of other organisations.

3. *Researches:* Wildlife researches on scientific lines has not yet caught up in the academic spheres, perhaps because of lack of aptitude or of severe outdoor activity and perhaps more due to lack of facilities available for such studies. As already indicated above, students coming out of Universities are practically uanware of the ABC of wildlife, its conservation and problems related to it. This is the basic shortcoming. Premier Institutes like Forest Research Institute and Zoological Survey of India which are supposed to be the cradle for sponsoring researches on this aspect, somehow and somewhere burried their proposals in the papers earlier. However, during the recent plans, researches on the wildlife, animal behaviour and animal population studies have since been initiated in the Zoological Survey of India. The credit for this goes to Dr. M.L. Roonwal and Dr. A.P. Kapur, both ex-Directors. But only one Institute may not be enough for this work.

On the lines of "Project Tiger" few other important projects may be initiated immediately, for this liberal fellowships may be granted to experts with financial assistance, such projects may be made time bound. It is, therefore, suggested that various organisations may be asked to initiate studies on the following projects for the present:

- (a) Fauna of certain area 'A' and threatened species in area 'A'.
- (b) Food availability of threatened species in area 'A'.
- (c) Breeding of threatened species in area 'A'.
- (d) Studies on farming of threatened species in area 'A' etc.

Introduction of a species within an area must not be encouraged without any scientific study of that area and the species in relation to the habitat. For such purpose a committee of experts under Inspector General of Forests be formulated before formulation of a policy.

Population Census in respect of certain animals liked for their skin, fur and feathers have become necessary and may be undertaken in right earnest in order to maintain the natural balance in nature and to meet the ever-increasing demand for commercial exploitation.

Co-ordinated Projects: Projects related to certain States may be co-ordinated with the co-operation of regional experts of Z.S.I. and B.S.I. and forest officers and other experts in that group. Some percentage of finance be borne by the States also. Such co-ordinated projects be initiated atleast in each State of India.

4. *Administration:* (a) Each State in India by special ordinance should declare their own prized wildlife species as the State Animal on the same pattern as is being done in case of India's National Bird. Wide publicity of such State Animals be done and due protection be given atleast to these species. As is being done in West Bengal, where Royal Bengal Tiger can be seen engrossed on each transport buses.

(b) The areas coming under National Parks and Sanctuaries be protected from encroachment and the space left for future expansion.

(c) Creation of a separate department of Forest Conservation and Pollution be created at the Centre and in each State including wildlife tourism, with attached research laboratories for studying the behaviour, biology and population studies of threatened and endangered species. The Ministry's and department status should be independent and it should not be attached with Ministry of Agriculture.

(d) A sizable amount of the profits from the sale of animal products and exports be allocated towards conservation. Dealers should be charged extra surcharge, on the sale of wildlife products.

(e) Heavier penalties may be imposed on poachers and traders having undeclared furs.

(f) All cases of wildlife poaching and other similar offences be dealt by Conservator, DFO of the area, who should be vested with the magisterial powers.

(g) The management of National Parks be put under one Central Agency, enforcing uniform rules and regulations. More ecologists and naturalists be included in the Wildlife Board.

(h) Animal Census be undertaken at regular intervals in various parks and sanctuaries. More animals be released in certain parks in suitable ecological habitats.

(i) Stricter watch and guards be kept on various natural lakes visited by thousand of migratory birds.

(j) Strict control on the fur dealers of important cities be imposed and they should be asked to declare their stock and the source from which these were obtained. Vigorous action against the proliferation of processed Cat Skins in furriers shops and traffic in uncared skins should be sanctioned. The enforcement of protective laws needs strict discipline. As a test measure even no tourist be allowed to take out wildlife produce in any form for few years. Killing of certain protected species by poachers be strictly viewed and severely punished.

(k) Scientifically trained persons be appointed at the respective sea and airports, through which these commodities are exported for strictly checking the material under export so that restricted or banned produce may not be allowed to be moved out in any form or shape. More rigid measures by passing necessary legislation for defaulters be imposed.

(l) Laws be made and enacted to make poaching a non-profitable business and a serious offence leading to imprisonment.

(m) A committee of experts should be constituted for giving Annual awards to suitable people every year for the efforts made in the preservation and conservation of wildlife or for the work related with better management of wildlife etc. The awards should be distributed by the President, for making the event as one of National significance. The awards may be named as 'Ashoka awards' after the great Emperor Ashoka who spread the cult of non-violence and propagated the idea of animal preservation. Also as on the replicas of India's National Insignia on the pillar portion at many places there are engraving that preservation of animals and faunal heritage be done viz., on the iron pillar edict in Delhi.

(n) Establishment of 'mini sanctuaries' as stressed by Dr. Ajai Man Singh for maintaining the natural balance may be given a serious thinking by the Wildlife Board. Few pilot schemes may be initiated on experimental basis. For the immediate purpose Haryana

State may be selected, as the State has shown fascination and keen interest in developing places for tourist and scenic interest under the erstwhile energetic Chief Minister Shri Bansi Lal, who has also named many State Enterprises after the names of birds. In fact he may be invited to join the Wild Life Board.

(o) A co-ordinated policy from National to village level be formulated for conserving wildlife.

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Fellowships for Training in Game Farming

Five fellowships, with a total value of US \$16,200 have been offered to the Indian Government under the project sponsored by UNDP and FAO for training in game farming. The proposed fellowships will enable five qualified wildlife officials from India to study game farming abroad with the intent that game farms will be established in India after their return.

Game farms in other countries have proven to provide not only valuable sources of protein and employment for both rural and urban communities, but also serve as tourist and recreational centres. Previously unproductive marginal land areas, especially in India, can be used for the farming of various animals such as partridge, quail, pheasant, deer, and fish. The training of the five officials is to include six months in New Zealand for the study of deer farms, six months for game birds in Bulgaria, Hungary or Yugoslavia; and six months for trout farming in the USA.

On National Forest Policy

*SHRI P.K. DEO, M.P.

The National Forest Policy formulated in 1952 emphasised the need for afforestation to cover 33.3 per cent of the entire area of the country. I urge upon the Government to have a more realistic and pragmatic national policy in view of the disappearance, at a frightening pace, at huge economic and ecological cost, of the forests in our country.

We had enough lip-sympathy regarding preservation of forests and we have enough of "VANAMAHOTSAV" but so far we have been unable to fulfil our target. Not more than 22.7 % of our country has been covered with forests and that too, to me is a very big claim because I know that there are many reserve forests just for name sake, and not a single tree is to be seen there. Those areas have been encroached by unauthorised cultivation. Stealing of timber has been going on on a large scale by the contractors and by the neighbouring villagers.

80.1 per cent of India's 550 million people live in the villages and one-fifth of the world's cattle population lives in rural India. This vast human and animal population has been growing at a fast rate. So far as population growth is concerned it has been rising at the rate of 2.5 % every year with accompanying enormous demand for fuel wood, small timber for agricultural implements, for rural housing, thorns and bamboos for fencing, thatch for roof and timber for doors and furniture, packing cases and railway sleepers. The requirement of fire wood alone is estimated to grow up to 256 million cubic metres by 1980 and 300 million cubic metres by 1990 as compared to 203 million cubic metres in 1970. This will result in a gap of 100 million cubic metres of timber between demand and supply. This has to be looked into from today.

The per capita forest area in this country is only 0.14 hectare as compared to double this figure in Asia. It is 16 times in Africa, 28 times in U.S.S.R., 34 times in Pacific region, 40 times in South America and 9 times in the world as a whole.

Contrary to our National Forest Policy of 1952, 1,83,625 hectares of reserve forest has been lost in River Valley Projects, expansion of agriculture, new townships and resettlement of refugees, more particularly in the Dandakaranya area in Orissa and Madhya Pradesh, by setting up of various industries, construction of roads, canals, transmission lines, and last but not the least, illicit felling which is the biggest menace to forest growth in this country. While our forests have been dwindling, the demand for fuel wood and timber and minor forest produce has been increasing very fast. In my State of Orissa, the total

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←Picture No. 1. Orissa State Highway No. 2 where Avenue trees are recklessly destroyed.



Picture No. 3.
The remnant of a huge *Ficus-religiosa* tree (Peepal) which was a massive tree six months back.



←Picture No. 2. The barks are peeled and wood hewn in pieces as a result of which the tree dies.



Photo shows Dr. Seal holding a male sambhar (*Cervus unicolor*) which is immobilized. Photo taken after about a minute of administering antidote M 50-50. The animal is on way to recovery. The collar containing radiotransmitter fitted while the animal was immobilized can be seen round the neck of the animal. The Cap-Chur rifle used for firing syringe-dart in Dr. Seal's trial can also be seen in the hands of V.B. Gaur, Dy. Director, Project Tiger, Corbett Tiger Reserve.



A male langur under tranquilized state. The drug used was *Katamine*.

—Photo by author
(See Page No. 27)

forest area is 6740 sq. km. of which 3158 sq. km. are yet to be demarcated and reserved. So nearly half of the forest area has been converted into reserve forests and the rest is still lying undemarcated. We note here with great concern the forest denudation that has been going on at an alarming pace. That deforestation causes misery to the people there is no doubt. This disappearance of forests will bring in its train awesome land slides and soil erosion, land productivity will go down, climatic changes will take place, streams will dry up and the irrigation and power projects—on which so much money has been spent will be silted up in no time and it will increase the incidence of floods. Both ecological and environmental damage will be done affecting the climate, the flora and fauna of the entire area. So, taking into consideration all these factors, when I tried to analyse them, I found that there are three main causes. No. 1 is the indiscriminate cutting of the trees by the villagers to meet the demand for firewood. So far as the avenue trees are concerned, I feel it my duty to bring to the notice of the Government that even avenue trees which are 100 to 150 years old and particularly in my constituency trees which have been planted by my ancestors, have been mercilessly hacked down under the very nose of the government officials. All my attempts to bring it to the notice of the authorities in the Block Development Board meetings and the District Development Board meetings have been just a cry in wilderness.

A directive has been sent from the Centre that fast-growing trees should be planted on both sides of the roads and on the banks of the canals. But it is only in Haryana and Punjab that they have taken steps in this regard. It is really a pleasure to drive on the State Highways or the National Highways in Punjab and Haryana and you feel as if you are driving through a garden. But, so far as other States are concerned, it is far from satisfactory, and the avenue trees are being mercilessly cut down. Even mango groves are being cut down in U.P. and Bihar where it used to be considered a pious and religious duty to plant a mango grove during ones life-time and the mango trees are also fast disappearing. Thus there has been a complete denudation of the forest wealth of the country. The States have been asked to form Forest Corporations to exploit the forest wealth of the States. But once the juggernaut of the contractors moves into the forest area, they overbid at the auction of coupes even though there has been enumeration of the trees by the forest officials and they know the worth of the timber that will be available from the area. In spite of this, for the sake of revenue, they permit over-bidding and they give the licences to the highest bidder. As a result they come there and try to steal from the neighbouring forests and they completely upset the working plan of the forest prepared on a scientific basis, to provide a rotation of nearly 30 years for the trees to re-grow. In this regard, I would request the Minister concerned to send the IG of or any other high officer in his Ministry, to see in my area. Especially, I request him to come

and see the Urladani reserve forest which is the catchment area of the UTAI project which is on a perennial river and where just by diversion, we are irrigating 30,000 acres of land even in the dry season. Its perennial flow in the catchment area will no longer be there because of indiscriminate felling of trees. In no time that beautiful irrigation project will be spoiled. Let him go and see the Karlapat Reserve forest which is the source of the Sagra river. This is a perennial river and on it depends the water supply system of the town of Bhawanipatna, the headquarters of the Kalahandi District. In my life-time the Sagra river has never dried up. It is because of the indiscriminate felling of the trees in the catchment area that last year there was no flow of water in the Sagra river and the people of the district headquarters had to suffer for shortage of drinking water.

The third problem is about the shifting cultivation resorted to by the tribals. Much money has been spent for the tribals. I request that they should be persuaded to take to plough and they should be settled on the plains land. All the surplus land which would be available after the land reforms should be earmarked to settle these tribals and to persuade them to come down from the hill slopes, take to plough and to give up their old traditional way of cultivation.

The fourth is land hunger. There has been a systematic encroachment. In spite of the best efforts of the Government officials, it is because of the petty corrupt forest guards or foresters in the forest area that the forest has been destroyed by the local villagers. There should not be any isolated approach or tinkering with a problem like this. We shall have to go to the root of the problem and its various ramifications. Then only can we expect concrete results.

Some experts have pointed out that Rajasthan Thar desert has been advancing eastward at the rate of 1 K.M. every year. So far as my district is concerned, when I was a child, I remember, we used to have annual rainfall of 65" but now it has come down to 35". It is because there has been indiscriminate felling of trees, and complete denudation of forests in that area and more so, it has become a post-independence feature. We had merger of the Kalahandi State on 1.1.1948 and there was one patch of reserve forest in my constituency by the name of Jalbandha forests. Within 15 days the entire reserve forest was not to be seen. After the trees are lost, it is the grass which holds the soil. Because of overgrazing by the cattle, the top soil is either blown away or washed away and only the sand dunes are found as in a desert. In my area you will find huge granite rocky boulders without any top soil. So, there is absolutely no chance and there is no capacity in the land to support either trees or life.

Therefore dynamic and effective steps should be taken as has been done in the USA, Canada and some parts of Europe. China has taken a very bold step in this regard. During Mao's regime it has become the duty of every Chinese citizen to plant trees. Now all former barren areas have been covered with trees.

I find that a new awareness has recently dawned and recently a seminar was held in Ahmedabad from 20th to 24th of February this year on Social Forestry. They made various valuable recommendations. I request that the Government should consider those aspects and try to implement them on top priority.

I would like to suggest that anti-soil-erosion measures like contour-bunding, soil conservation, afforestation in the catchment area of proposed dams, etc. should be taken up. Tree leaves and the other plants produce rich humus. If they are untouched, they form a porous spongy mass which absorbs, retains and regulates the flow of rain water. By the time the dam is completed there would be little scope for the reservoirs getting silted up. I would also suggest that quick-growing trees like eucalyptus, casuarina, sisoo, teak, babul, rain-tree, etc., should be grown on waste lands.

I would like to point out that the Arizona Arid Land Research Centre has recently developed a new tree, that is, Ajman's Gogoba. The life span of the tree is 300 years. The leaves provide nutrition to the animals, the seeds provide a vegetable oil. The trees act as wind-breakers in the desert area.

I think the Centre cannot take all the responsibility in both hands. It is a programme of the people and hence for the people. People should be educated. The usefulness of trees has to be taught from the very childhood and it should find a place in the school curriculum; it should be publicised through the various publicity media.

I am glad that there has been a new awareness in some sections of our people which has manifested itself in the Chipko movement in Uttarakhand, U.P.

For cutting down of trees, I suggest, there should be drastic penal laws.

I am glad that the Government of India has made some provision to give an impetus to social forestry. They have provided a subsidy of 75% to the panchayats and 50% to the States for which a provision of Rs. 10 crores has been made in the Fifth Five-Year Plan. The State Governments also have made a provision of Rs. 20 crores. So, in all, if these Rs. 30 crores are properly utilised, we would be able to achieve something.

I also suggest that an alternative source of energy be found out. Now, people have started using petroleum gas for cooking. But it has become very expensive and it is not easily available. So, the gobar gas plant, which has become very popular in Haryana has to be popularised in the other States. We are surplus in coal. People should be habituated to cook on coal.

Solar energy has to be tapped. A colleague of mine in the Second Lok Sabha invented a solar cooker. But it is very expensive. Some indigenous type of cheap solar cooker may be provided to the people so that they can cook food.

My last suggestion is that forestry should be a Central subject. It should find a place in List No. 1 of the Seventh Schedule of our Constitution. So far as the Central Government is concerned, I am sure, that they will not be interested in the revenue part of it. But, from the ecological point of view and from the point of view of soil conservation, flood control and preservation of wildlife, it can be the concern of the nation.

I believe that a new forest policy is on the anvil. Will all the suggestions made here find a place in the new forest policy? If necessary, the Constitution may be amended. I am sure, all in the Lok Sabha will support such a move.

The Introduction or Rehabilitation of Swamp Deer (Barasingha) into other Parts of India

By

H.P. AGRAWAL

India is a country of considerable size (about 3,268,100 sq. km.) and varied physical and climatic features. In her rich and varied wildlife, India has a precious heritage of which she may justly be proud. The cultural development of a country is not only judged by its arts and architecture, philosophy and literature, but also how it preserves its historic heritage and its natural resources.

The Red Data Book of the I.U.C.N., edited by Noel Simon, lists about 17 species as 'endangered' within or near about Indian confines. One of them is Swamp deer or Barasingha.

According to Clutton-Brock (1956), the fossil records reveal that this species was distributed throughout the basin of the Indus, the Ganges and the Brahmaputra ranging upto Godavari river in the south and Gujarat in the west. But according to Burton (1952), today it has disappeared from the western part of its range. Even upto the last century its distribution was throughout the base of Himalayas, from Assam to Indo-Gangetic plains upto Rohri in upper Sind, and throughout the area between the Ganges and the Godavari in the south (Blandford, 1889-91; Brander, 1923; Prater, 1934; 1948; Gee, 1964). Today it exists only in a few isolated parts. They are mainly in the North Kheri Forest Division in Uttar Pradesh and adjoining areas of the South-western Nepal. Assam and Bengal are also inhabited by few herds. The surviving population in Central India is restricted only to a few districts.

India can save its big game species by starting a "crash programme" to find the ecological and economic aspects and facts necessary for the maintenance and regulation of its faunal assets.

There are many reasons and varying views about the decrease in number of the swamp deer. Some of the factors are poaching, diseases, predators and improper habitat. During recent years, the mounting pressure of an ever-increasing human population has led to a progressive diminution of forest cover which afforded the traditional protection to animals.

Anyway, whatever may be reasons for its shrinking the population from the plains of India, the fact remains that they are now confined a small tract of the country. India owes

not only to itself, but to the world at large to save from extinction its surviving link with its ancient past in the shape of its twelve-horned deer, "Barasingha". This posed a serious problem about their survival. Therefore, as an insurance against any mishap which might overtake this helpless animal in its existing haunts, it would be advisable or the only alternative is rehabilitation or in other words to find alternative homes in as many places as may be found suitable for their introduction. If the swamp deer can breed and survive properly in some other areas. It can be trusted to look after itself in other more hospitable regions in India and elsewhere.

There is no cause for pessimism in the success of our efforts to find a second home for the swamp deer provided a suitable habitat is selected and adequate steps are taken to keep a constant vigil on their movements and reactions to the new surroundings. For this purpose, the following steps are essentials :—

i) The area selected for the purpose must be quite large. It should not be a narrow strip and should be of sufficient depth, so that there is very little chance of their going out into the adjoining forests.

ii) All cultivation and grazing inside the area should be prohibited in order to avoid any type of disturbance to these animals.

iii) The area selected should be closed to shooting and grazing at least 3 or 4 years in advance.

iv) Sufficient number of water holes should be provided.

When deer become under-nourished and weak, their breeding ability is also affected and many fall an easy prey to predators. The ability of doe's to produce fawns varies widely and is correlated with food supply.

v) Necessary protection should be afforded against poaching.

vi) The researches should find out the actual intake of different herbs, grasses, flowers and fruits and the effect of each floral species on the life and health of swamp deer.

So in order to select alternate homes for swamp deer or to introduce them in new areas having desired habitat conditions and to increase the shrinking population of the swamp deer, what we are expected to do in addition to enforcing the game laws, is to check indiscriminate clear felling of the forests, protect them from burning and over grazing, create small openings conducive to wildlife by doing selective fellings; do thoughtful planting of food and eliminate predators.

The pros and cons of such introduction or rehabilitation are mentioned in brief as under—

I. Policy—

a) It is an internationally accepted principle, and also the national policy of India (as expressed in resolutions passed by the I.B.W.L.), that species which formerly existed in a part of the country but are now extinct may be reintroduced into that part provided the climate and vegetation are still suitable (to be ascertained by an ecological survey by experts). This means that the swamp deer could in principle be re-introduced into some parts where it existed before (see third Paragraph).

b) It is an international principle, and also the national policy of India, that new species should not be introduced into places where they have never before existed, except under expert advice after ecological studies have been conducted. This means that swamp deer, although it is an adaptable creature and could easily live in most part of the country, should not be introduced except on expert advice because it has never before existed there.

c) It has been internationally and nationally agreed that new species of fauna from outside should not be introduced into a national park, where the agreed objective is to show the indigenous and native fauna and not exotic species which are usually shown in zoological parks and gardens.

II. Expenditure—

The above involve financial implications and must be considered fully before launching the experiments for introducing the swamp deer in any tract.

III. Peculiar habits of swamp deer—

Swamp deer lives in marshy and open grassland and is essentially an animal of the wide open spaces. They love the sun, and once the grasses are burnt from February onwards, and the new shoots start sprouting they can be seen in large herds sunning themselves, which they seem to do in the hottest weather.

IV. Conclusion

To introduce or re-introduce swamp deer or Barasingha into a place which might appear to be suitable for the species to live in would be a very costly affair, and most probably not bring about the desired result, i.e., the swamp deer would probably not be seen by visitors, they might not breed, and they would run a great risk of being killed by cultivators or poachers, which will result in their complete destruction. It is not sufficiently realized that once a

species, more particularly a gregarious one; begins to go downhill, its rehabilitation becomes extremely difficult.

Wildlife is low, awfully low, on the priority list. There is no awakening in the people, no realisation in the officials that this is a heritage which is not ours to squander, it is in trust, for us to hand down to those who follow us.

Late Pandit Jawahar Lal Nehru stated "I welcome this new interest in India in the preservation of wildlife.....life would become very dull and colourless if we did not have these magnificent animals to look at and to play with....."

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Wild Elephants

By

MD. ALI REZA KHAN

Probably our knowledge regarding ecology and behaviour of elephants especially wild ones is not sufficient. During my few visits to the Western Ghats in connection with the study of the Black-and-Orange Flycatcher, *Muscicapa nigrorufa* (Muscicapidae), I had some opportunities of watching wild elephants. The little that I have observed may be of some interest to elephant lovers.

I visited Periyar Wildlife Sanctuary on January 5 and 6, 1976. I was watching a small herd of three elephants, one small tusker and females. They were about 10 metres from our boat and 4 m within the water level of Periyar Lake. The engine noise of the boat apparently did not alarm the herd except that instead of facing the boat they turned their back towards us. A group of about 10 Jungle Myna, *Acridotheres fuscus* (Sturnidae), was also busy collecting insects underneath or around the elephants. The little tusker seemed to be a bit irritated by the hopping and sallying out of the mynas. He was trying to hit them by turning, twisting and throwing the trunk (proboscis) towards the mynas, but the trunk never reached the mynas as they were always flitting for insects. Lastly I found him kicking one of its hind-limbs with a view to hitting the mynas. During my 20 minutes observation at 12-15 hours I saw him kicking legs nine times. While this small tusker appeared to be much disturbed by the activities of the mynas the females were grazing without any sign of being disturbed.

In another herd, some 30 m away, there were about 10 elephants. A small-tusked male, two babies and remaining females composed the herd. The tusker, babies and one of the females were on boggy-soil while others were grazing nearby. The tusker was probably playing with one of the babies. He was stepping forward, and then moving back slowly with a hind-limb slightly stretched. With this extended limb he was slowly pushing the baby elephant. As a result the baby also moved a few steps back. The male then withdrew its leg and repeated the earlier tactics. The baby always followed the male. This continued for about 10 minutes until the other members of the herd were moving towards the tall grasses as a result of sudden arrival of two more motor boats with tourists on the roof. Whether this was a simple play, as elephants are considered to be play-ful, or a sort of training for the baby, is not clear.

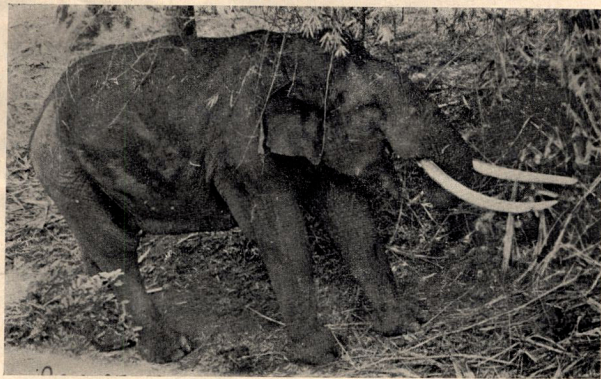
On December 6, 1975, I went to Masinagudi—close to Mudumalai Wildlife Sanctuary of the Nilgiris—along with Dr. Salim Ali—my teacher. From an old bamboo-machan in the Cheetal Walk (private house of Mr. E.R.C. Davidar—a well-known Wildlife Photo-

grapher) compound my friend R. Sugathan, Research Fellow of Patrice Lumumba University, Moscow, and myself were watching two elephants each one having very good tusks. They were only three metres away from us. One of these was inside knee-deep water of feebly flowing Segur River. The other was on the bank of this river amongst dead bamboos a (*Bambusa arundinacea* of this area started flowering towards the end of 1974 and most of the clumps are dead and dried up) little away from the former. This tusker was tearing off dead and dry parts of bamboos. Later on he was chewing and finally swallowed those bamboos. There were a few partly green bamboos in the neighbouring clumps. In addition there were species of *Acacia* scrubs which are also eaten by wild elephants. Why this elephant was eating dry and dead bamboos needs further study.



PICTURE-ONE

The elephant is throwing its right, hind limb.



Upwardly curved Tusker eating up dead bamboos.

—Photos by M.A.R. Khan



फरिस्ट लाज में मुख्य मंत्री श्री जोशी राजस्थानी साड़ी भेट करते हुये । लेखक दूरबीन के साथ ।
(जन सम्पर्क कार्यालय, जयपुर के सोजन्य से)



जांघिल व जलकौवे नीड़ो पर

— छायाकार श्री आनन्द झाचार्य
[See Page No. 5 (Hindi)]

The Cause of Large-Scale Mortality of Fish in Ramganga River (1976)

(CORBETT NATIONAL PARK, U.P.)

I have read with interest a case of large-scale mortality of fish in Ramganga river as a result of hailstorm reported by Dr. B.S. Lamba (*Cheetal*; 17 (2);49, 1976). In the list of 29 species of fishes of the Corbett National Park given by Husain (*Cheetal*; 17(2):39-42, 1976), there are only two species of Mahseer [viz. *Tor putitora* (Hamilton) and *Tor tor* (Hamilton)] and the Goonch (*Bagarius bagarius* (Hamilton) which are important from commercial and game points of view. The size of these species, as informed by Sh. C.B. Singh (Lamba, Op. cit.) i.e. 4½ feet and the skeletons of Goonch, measuring more than a metre in length as seen by Dr. Lamba, are moderately good sizes for these fishes, although the record of maximum size to which the yellow-finned Mahseer (*T. putitora*) grows is 2.75 metres the red-finned Mahseer (*T. tor*) 1.52 metres and the Goonch (*B. baagius*) 1.52 metres. The large-scale mortality of these important game-fishes should be really a matter of concern for the game lovers and the Park authorities.

Apart from the two possible reasons of the fish mortality given by Lamba (Op. cit.), the fish could have died as a result of heavy poisoning of the water by the fruits, leaves and branches of some plants that might be growing in the Park along the river Ramganga and could have fallen in sufficient quantity into the water as a result of strong wind which usually precedes a heavy rain. I remember to have seen a list of plants, the fruits or leaves of which act as fish poisons (drawn up by the Botanical Survey of India, Calcutta). A comparison of the flora of the Park with the list of poisonous plants could help in ascertaining the species of plants which could have caused the havoc to the important Game fishes of the river

Of the two reasons, offered by Lamba (Op. cit.) the first one i.e. the fish died because of the high intensity of the pressure waves in water caused by the hail-storm and the comparison of these pressure waves with those caused by the explosives, used under water, is clearly untenable because the intensity of the pressure waves caused by the hail-storm on the one hand and the explosive on other hand is quite different. The one caused by the under-water explosion could kill these heavy monsters because of its tremendous force which is many times higher in intensity than that caused by the hail-storm. The latter would hardly have any effect on these heavily built fishes.

The second reason (Lamba, Op. cit.) is more plausible because the hail-stones, which usually have embedded in themselves some very poisonous spores of fungi and pollen grains of

plants, when engulfed by animals and even man, can cause serious poisoning and even death. The poisonous spores of fungi and pollen grains of plants usually float high up in the atmosphere and around these particles, water accumulates and gets frozen, forming poisonous hail-stones. The mahseer and the Goomch are omnivorous and usually rush to the spot in water where they observe the falling of some object and try to engulf it. Engulfing of such hail-stones falling in water could have killed these fishes.

In fact, to suggest a reason of the large-scale mortality of fish in Ramganga river at this stage would be no more than a conjecture. Had the park authorities, particularly those who observed the freshly dead fishes, collected the gut contents of the fishes and got them analysed through a competent source, the results of such an analysis could perhaps throw more light on the possible cause of death of the fishes. It may be added that in all probability, the large scale mortality of the game-fishes in Ramganga was due to heavy poisoning.

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Drug Immobilisation Trials on Freelifing Indian Wild Animals

By

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Introduction

Drug immobilisation of free-living mammalian species of India has been tried on a very limited scale. The first well-known experiment was made on a wild tigress (*Panthera tigris*) by Dr. John Seidensticker, a Research Associate with Smithsonian Institution, Tiger Ecology Project, Nepal in the Sunderbans forests of West Bengal in the year 1974. Second series of trials was made by Dr. S.R. Amladi of G.S. Medical College, Bombay on spotted deer (*Axis axis*) in the Bannerghata Park of Karnataka in the year 1975. The third and extensive series of trials was carried out in the Bharatpur and Sawai Madhopur wildlife sanctuaries of Rajasthan in the month of April 1976 by Dr. Ulyses S. Seal from the Department of Biochemistry, Veterans Administration Hospital, Minneapolis Minnesota, USA. I was present during the last series of experiments as a participant trainee of the course on the immobilisation of wild animals that Dr. Seal conducted from 9th to 22nd April 1976. The present paper is an attempt to put together the available information on the above trials.

The method of capturing free-living wild animals by means of drug darts originated in 1953 when Hall, Taft, Baker and Aub captured large numbers of deer in order to study antler-growth (U. De V. Pienaar, 1973). Since then rapid progress has been made in this field chiefly due to the pioneering works carried out by workers in South Africa and later in the United States. Now over 50 different drugs are used for immobilising animals. A number of darting devices for remote administration of these drugs have been developed chiefly by South Africa, the United States and New Zealand. Drug immobilisation has already become a very important scientific tool for use by both wildlife managers and research workers. Translocation of rare animals to areas of safety such as that of white rhinoceros in South Africa (Player, 1967) have been possible chiefly due to this technique. Schaller (1972) immobilised 166 lions in the Serengeti National Park of Tanzania for scientific studies. Dr. Seal has tried this technique successfully on over 7000 animals belonging to 115 species in captive and free-living states. The critical factor in immobilising of free-living wild animals has been the employment of right kind of drugs and their dosages. As very

limited work has been done in India for determining correct dosages for various species, no drug dosages have been firmly recommended at the present stage. However, based on his trials on Indian species in captivity in the American zoos and his experience with other species in field Dr. Seal circulated among the trainees of the Tranquilising and Telemetry Course arranged by the Project Tiger with the collaboration of the World Wildlife Fund from 9th to 22nd April, 1976 at Dehra Dun and Chilla (U.P.), Bharatpur and Sawai Madhopur (Rajasthan) his recommended dosages for various Indian species. This list is expected to provide a guide to the immobilising trials that might be undertaken in future. This drug data for Indian mammals has been reproduced as an appendix to this paper.

Immobilizing of Predators

Tiger (Panthera tigris tigris)

The only known experiment of immobilizing a wild Indian predator is that of a Sunderbans tigress which had turned maneater. This was an adult tigress which was subsequently named Sundari. Full authentic details about the experiment could not be obtained though it was learnt that the drug used was CI 744. This tigress was immobilised by darting the drug from a distance with a dart gun. The whole experiment was done under the technical guidance of Dr. John Seidensticker who had successfully tried this drug on three tigers, two females and one male in Nepal under the Tiger Ecology Project during 1973-74. Sundari was immobilised in 1974. After immobilising she was transferred to a cage and later taken to a site in Sunderbans where she was released. After 2-3 days she was found to be dead. Officially the cause of death was ascribed to a fight between the tigress and the male tiger in whose territory she had been released. It would be indeed helpful for further trials if full report of this first ever experiment of the kind in India is published for general benefit.

Though full details about this tigress trial is not available still the drug dosages tried by Dr. Seidensticker in his experiments in Nepal should provide useful information in this regard. In the Special Technical Report dated 28 May 1974, he and Tamang (1974) have given the dosages tried with CI 744. This drug does not have an antidote and hence the only way the drugged animal overcomes the effect of the drug is through restoration in normal physiological processes and hence there is a relatively longer time interval elapsing between the onset of the effects of immobilising and full recovery to the free-moving state. If antidotes are administered, where they are available as in case of some of the trials described later, the recovery is dramatically rapid. The drug dosages tried and other information is given in the following table.

Table 1.
Drug dosages tried on tigers in Nepal

Serial No.	Sex	Estimated Wt. Kg.	Mg. CI 744 per kg. body weight	Induction time Min.	Recovery time	Comments
1.	Adult female	150	4.0	Not given	3 hrs 45 min	"she was located, immobilised 50 metres away"
2.	Adult male	200 kg.	1st dose 2.5	"within 45 minutes after darting he was unmanageable to the point where we could not attach transmitter"		
			2nd dose 1.0			
3.	Female cub	52 kg.	7.7	Not given.	5½ hours	"5½ hours after darting, she could raise her head. One hour later she moved off..."

The drugs were administered with 3 cc syringe darts with $\frac{3}{8}$ -inch barbed needles fired from Cap-chur projector. The projector and the syringes were manufactured by the Palmer Chemical Equipment Co., Douglasville, USA while the drug was a product of the Parke-Davis and Company, Detroit, Michigan, USA. The authors claim a wide margin of safety with this drug and concluded that with a suitable dose (4-5 mg/kg), the duration of the immobilisation was sufficient time to locate individuals after darting to tag, collect ectoparasites, and to set radio transmitters.

Panther (Panthera pardus)

No trials on immobilising panthers in wild state have been reported from India. Seidensticker *et al.* (loc. cit.) using CI 744 immobilised 2 adult female panthers weighing 40 and 48 kg respectively. Dosage in both cases was 6.25 mg/kg body weight. The first pantheress was also darted again after two days of first successful immobilisation with a dosage of 5 mg/kg. The animals were able to pull themselves away within a period of $2\frac{3}{4}$ to 3 hours of darting. The panthers apparently recovered more rapidly than the tigers.

Lion (Panthera leo)

Though there have been numerous trials on the African race of lion (*Panthera leo leo*) no such trials have so far been initiated on the Indian lion which is now restricted to the Gir forests of Gujarat. The latest trials on a truly large scale were undertaken by George Schaller (1972) with succinylcholine chloride at a concentration of 50 mg per cc that was darted by a syringe from a carbon-dioxide-powered Cap-Chur gun (Palmer Chemical and Equipment Co.). He determined the correct dosage by injecting increasing amounts into different animals until one could be handled. The average dosages were: adult female, approximate wt. 114 to 136 kg, 65-70 mg, or about 1 mg per 1.86 kg; adult male, approx. wt. 159 to 182 kg, 80-85 mg or about 1 mg per 2.09 kg. Large males and females were given as much as 5 mg more than the above doses. Small individuals were given correspondingly less. Normal dose was also found to be inadequate if the animal had been running or had taken a large meal before the darting. The shots were taken from within about 20 to 25 metres of a lion while it was standing or lying. Given an accurate dose, he reports, the lion reclined on its side and was approachable within 1.5 to 8 minutes. The animal raised its head again, 'seemingly alert but often still unable to stand', after about 25 minutes.

Immobilising of Herbivores

Feral Cattle (Bos indicus)

In many parts of India domestic cattle have often turned feral and found destroying agricultural crops thus incurring wrath of local people. As the prevalent sentiments do not allow killing of these cattle the number increases rapidly. They move in herds and are remarkably agile compared to their domestic relatives and are difficult to trap. Some such herds have been roaming in the Bharatpur sanctuary in Rajasthan. As it had been problematic to control their numbers it was thought appropriate to castrate their bulls after immobilising them. Four individuals, 3 bulls and 1 cow, were darted a combination of drugs (Table 2).

The syringe were fired from a Cap-Chur rifle. This weapon is an improvement upon the carbon-dioxide-powered Cap-Chur gun. The rifle does not use carbon-dioxide gas but uses charges in cartridge form not unlike a .22 cartridge. Charges are available in three powers, their use being determined by the distance from which a syringe was fired. Yellow charge, the light powered one, was employed from within a distance of 20 metres, green the medium one from 20-40 metres and the red the heavy one for distances of 40-60 metres. Proper charge is required to be used to avoid the dart getting buried in the body of the animal which may even kill the animal. In early years of his work Dr. Seal lost an animal in 15 seconds due to this defect.

Table 2.

Drug dosage tried on Feral cattle (*Bos indicus*) by Dr. Seal in April 1976

Sl. No.	Sex	Drug used and its dosage	Induction time (time to go down after darting)	Antidose and dosage	Recovery time after giving antidote	Remarks
1	Male Bull Adult	1st Dose Rompun-300 mg Sernylan-75 mg Atropine-1.5 cc	Darted at 0650 No effect till 0815	—	—	On 15.4.1976 Bharatpur It salivated, then walked away
		2nd dose at 0815 M-99—2 mg	5 min (0815-0820)	M 50-50 4 mg	2 min (0845-0847)	Castrated. Slaggered a little after rising. Darts removed with acut of knife
		3rd dose Atropine—2 cc	—	—	—	For checking Salivation
2	-do-	Rompun—300 mg Sernylan —80 mg M-99 — 1 mg	12 min (0910-0922)	M 50-50 2 mg	6 min (0937-0943)	Castrated. On 5.4.1976 Bharatpur
3	Adult cow (with young calf)	1st dose on 15th April 1976 Rompun—150mg Sernylan— 50 mg Atropine— 1 cc	No effect		Watched it from 0617 to 0808	After some salivation it became normal and moved with the herd.
		2nd dose 16.4.76 Rompun—100 mg M 99— 4 mg	No effect	Darted at 0615	—	
		3rd Rompun—200 mg Sernylan—100 mg	-do-	Darted at 0715	—	20 cc Antibiotic
		4th Rompun—300mg Rompun — 1 mg	2 min (0745-0747)	M 50-50 10 mg	(about) 4 min (0804-0808)	(COMBIOTIC) injected intramuscularly.
4	Adult Bull	1st dose at 1650 Rompun—200 mg Sernylan—50 mg	No effect	—	—	On 14.4.76. Bharatpur. I was not present
		2nd dose at 1750 Rompun—100 mg Sernylan — 50 mg Atropine — 2 cc M 99 — 1 mg	10 min (1750-1800)	M 50-50 2 mg	Not noted	

The drugs tried were Rompun, Sernylan, M-99, and atropine in various combinations. M-99 is a very potent drug. Atropine was administered to reduce salivation and to reduce involuntary body movements. M-99 has a very effective antidote in M 50-50. Within a matter of about 5 minutes the animal used to overcome the effect of the drug sufficiently to be on its feet to run away. The bulls immobilised were castrated with a special instrument by a trained stockman of the Veterinary Department of Rajasthan. It is noteworthy that a cow and a bull could not be tranquilized till they were given additional dose of drugs that included M-99. Though this drug is very effective, it is very costly and at present not available in India. Overdose of this drug could be fatal. The cow which was injected Rompun, Sernylan and atropine on 15-4-76 overcame its effect without being immobilised. On the next day, it was located and had to be darted thrice with (i) Rompun, M-99, (ii) Rompun, Sernylan, and (iii) Rompun, M-99 before it finally went down. The antidote was administered in all cases in the jugular vein with a syringe. As the previous day's wound had turned bad, it was given an antibiotic injection of Combiotic—a combination of penicillin and streptomycin.

All the four animals that were tranquilized were brought back to consciousness with the help of antidote. The antidote given in each case was M 50-50 which is specific against M-99. The normal dosage of this antidote, as stated by Dr. Seal, was twice the amount of the drug M-99, injected intravenously but if this were difficult it could also be administered intramuscularly in which event the recovery would be delayed. He also told that the time for recovery would vary from animal to animal for the same species; this was indeed the case in the present series of trials. If antidote were not administered the animals would recover within 2 to 3 hours, he stated. All injections of antidote were given in the jugular vein in the neck.

The behaviour of the herd was not affected by the sight of the darted animal which would start trailing behind it or stagger or fall prior to losing all voluntary control over its body. However, the calf of the cow that was darted for quite some time kept near her though at the time of falling it kept with the main herd which had moved away.

Blue Bull or Nilgai (*Boselaphus tragocamelus*)

In all, five bluebulls were darted and tranquilized though one male had to be darted twice. The details of the animals and the drug dosage tried on them is given in Table 3. The first male that was shot in the forests near Shanti Kutir inside the Bharatpur bird sanctuary went down within about 40 metres of the darting spot, the dart falling down as it ran after being hit. Body measurements and anal temperature were taken. The animal slowed down breathing to the degree when it was thought fit to revive it which was done

Table 3.
Drug dosage tried on Blue bull (*Boselaphus tragocamelus*) by Dr. Seal in April 1976

Sl. No.	Sex	Drug used and its dosage	Induction time	Antidote and Dosage	Recovery time after giving antidote	Remarks
1	Male	Rompun—300 mg M-99 4 mg	11 min. (1825-1836)	M 50-50 8 mg	About 4 min. (1910-1914)	The animal appeared to be sinking and hence early administration of the antidote. On 15.4.76 in Bharatpur.
2	Male young	-do-	6 min. (1805-1811)	-do-	2 min. (1818-1820)	Respiration become irregular. It revived after antidote was given. On 16.4.76 in Bharatpur.
3	Male Adult	1st dose Rompun— 50 mg M-99 4 mg Atropine 7/10 cc	9 min. (0718-0727)	M 50-50 2 mg	4 min. (0731-0735)	Breathing became irregular and caused concern. Hence only one fourth the normal dose of antidote was given. But even with this, the animal was up and ran away. It was located and second shot given. A radio transmitter fitted around its neck in a collar. On 18.4.76 Sawai Madhpur.
		2nd dose Rompun— 50 mg M-99 1 mg	4 min. (0757-0801)	M 50-50 2 mg	3 min. (0808-0811)	
4	Female	Rompun— 50 mg M-99 3 mg Atropine 1 cc	7 min. (0806-0813)	M 50-50 6 mg	5 min. (0850-0855)	This dose appeared to be the right one. Breathing was even throughout. Radio collar put and eartags fitted. 10 cc of antibiotic given at 0848. 19.4.76 Sawai Madhopur.
5	Female	Rompun — 50 mg -do-	12 min. (06530705)	-do-	2 min. (0726-0728)	10 cc Antibiotic (COMBIOTIC) given at 0715. Radio collar and eartags fixed. On 22.4.76 Sawai Madhopur.

by injecting the normal dose of the antidote. The drug was very effective in bringing down the animal but if a vigilant eye had not been kept on breathing and prompt decision taken for administering the antidote, the consequences could have proved fatal for the animal. This underlined the need for a relatively harmless drug so that even if the operating technician were not a highly qualified medical man the animal could be free from mortal risks.

Bluebull No. 3 presented some problem when its breathing became so irregular as to cause concern and Dr. Seal decided to administer a partial dose of the antidote. But remarkably the animal soon came to its feet and revived sufficiently to overcome efforts of 5-6 strong men to restrain it. It ran out to the adjoining area. It was then immediately followed in the jeep and a second shot was put in, not very far from the first spot. The job of putting on the collar which was abandoned earlier due to the animal bolting away was now accomplished with speed. The running away of the animal even with a very partial dose of the antidote indicates the need for further trials for determining the exact dosage. However, it is noteworthy that the female at the serial number 4 in Table 3 behaved so well as to suggest that the exact dosage was almost worked out.

Sambhar (*Cervus unicolor*)

The series on sambhar consisted of 3 animals—an adult male and female and a young male. Of this the adult male which had shed its antlers could not be located after darting though extensive search for it was made for about 40 minutes within about a kilometre of the darting spot by about 15 men. The terrain was hilly, near the Ranthambhore fort, and failing any clue the search was abandoned. That day we could not get any information about it. The next day when we had been out for the day's work, hovering vultures in a spot on the nearby hillock about $\frac{1}{2}$ — $\frac{3}{4}$ kilometres of the darting spot pointed a dead body which was confirmed to be that of the same sambhar. Identification was easy because the barbed dart was attached to the neck where it had been hit. The heat was indeed intense on these days. When we approached the body the putrefying stench was intense and rigor mortis was very well advanced. Dr. Seal after examining the carcase opined that the death had occurred within 2 hours of darting—the most probable cause being the excessive heat the animal suffered after it had fallen unconscious in the open area almost on a rocky outcrop. Had it fallen under a shady cover, perhaps it might have had a higher chance of survival, he said. This case indicates the importance of tracking the animal after it has been darted and also the difficult task of searching a fleet-footed animal in a hilly terrain. It also suggests the need to search for a less harmful drug with required effectiveness, of course. The drug dosage for this and the other sambhars is given in Table 4. It is to be noted that the dosage tried for the remaining two animals appeared to be good for the purpose of the study.

Table 4

Drug dosage tried on Sambhar (*Cervus unicolor*) by Dr. Seal in April 1976 in Sawai Madhopur forests

Sl. No.	Sex	Drug used and its dosage	Induction time	Antidote & dosage	Recovery time after giving antidote	Remarks
1	Male Adult	Rompun -- 50 mg M 99 -- 4 mg Atropine -- 7/10 cc	Animal could not be located after darting	Could not be given	Animal was located the next day, that is 19.4.76, at 1040. It was dead with the dart present on the body. Dr. Seal opined it died about 2 hours after darting in a state of unconsciousness. It lay in open and perhaps high temp. overhead killed it. On 18.4.76.	
2	Female adult	Rompun -- 100 mg M 99 -- 5 mg Atropine -- 1 cc	15 min.	M 50-50 8 mg	1½ min. (1838-1839½)	Darted about 1800 hrs. It was doing well under tranquilizing. Radio-collar fixed. Only 8/10 of full dose of antidote was given. Dart had fallen after injecting the drug. On 18.4.76.
3	Male about 2 years old	Rompun -- 50 mg M 99 -- 3 mg Atropine -- 1 cc	5 min. (0703-0708)	M 50-50 6 mg	4 min. (0744-0748)	Radio-collar fixed. Eartags put. On 20.4.76, Sawai Madhopur. 10 cc of antibiotic (COMBIO-TIC) injected intramuscularly.

Spotted deer or Cheetal (*Axis axis*)

Trials by Dr. Amladi

Dr. S.R. Amladi, M.D., Associate Professor of Pharmacology, Seth G.S. Medical College, Bombay is the first investigator in India to have tried immobilisation of spotted deer in semi-open environment. He selected for his trials a captive population of about 25 cheetal that shared a 4-acre enclosure with some sambhar, hog-deer, four-horned antelope and a family of gaur. The drug used was the short-acting neuromuscular blocking agent, succinylcholine chloride and was administered intramuscularly by means of a drug-filled projectile syringe-dart fired from a Cap-Chur gun from a distance of 20 to 30 metres. While the drug dosage was worked out by him, the darting was done by S.A. Hussain of the Bombay Natural History Society. The details of the dosages, etc., tried on the two cheetal is summarised in Table 5. The same table also gives the details of the other three cheetal that were immobilised by Dr. Seal.

The cheetal No. 1 was completely immobilised within 8 minutes of the darting. Its breathing remained normal throughout. A plastic ear-tag was fixed. 48 minutes after darting some voluntary control of movements was restored though the animal was still unable to get up. After another 8 minutes it could walk again. No adverse effect was observed as reported by him (1975, Unpublished). No antidote was given nor does one exist for this drug perhaps. The second cheetal, a female, took 15 minutes to go down and recovered sufficiently to walk again after another 50 minutes. No antidote was given nor any adverse effect noticed.

It must be admitted that compared to the results obtained from the trials done in the Sawai Madhopur forests on cheetal the reported performance of the drug tried by Dr. Amladi is safer and simpler without being any less effective. Perhaps we could give this drug, succinylcholine chloride, more trials as it is also found highly effective in case of lions too as mentioned earlier in this paper. This could be a drug of choice for many of our wild mammalian species.

Trials by Dr. Seal

Of the 3 cheetal darted the dosages on atleast two did not appear to be suitable. One fully grown antlered male who was given an initial dose of 250 mg of CI744 through a dart-syringe and a subsequent dose of 50 mg given by hand after the animal had come down presented many difficulties in recovery. It was brought to a shady place for protecting it against excessive heat as the sun was indeed very uncomfortable that time of the day. But that was not enough to make a smooth recovery possible. In fact the animal caused quite a bit of concern and Dr. Seal was in continuous attendance administering all possible medical help that could be arranged in the field conditions. Despite all the treatments given as summarised in Table 5 and non-stop sprinkling of water that was brought in

buckets from a nearby stream the animal continued to be very restive and had to be held by a man to prevent any injury to it. The relief came after the local Wildlife Warden Fatehsingh Rathore ingeniously suggested forcing water down the animal's throat as they do in case of domestic cattle in Rajasthan. The suggestion was approved by Dr. Seal and with the help of an empty bottle of *Coca-Cola* plenty of water was forced down. The animal revived very fast after that and after rising walked away a distance of about 50 metres before sitting under a shady bush. Some more water with *Azium* and salt was forced down. The animal did survive as we could find out from its movements as also evidenced from the shifting radio signals received the next day from the transmitter fixed around its neck.

One more adult, cheetal No. 4 in Table 5, had to be hastily revived by administering antidote as it had started sinking. The female at serial No. 5 was on the other hand, not fully immobilised and had to be restrained physically by a man who sat on her chest so that a collar could be fixed round her neck.

On considering the response from the three cheetal tried Dr. Seal felt that an adequate dose for an adult cheetal could be: Rompun-26 mg, M99-1½ mg, and Atropine-½ cc. He considered this to be adequate for both the male and female. If no antidote were given, the immobilised animal would recover within a period of about 2-4 hours, he said.

Langur (*Presbytis entellus*)

Two langurs, a male and a female, were immobilised by giving them an injection of 60 mg and 50 mg of the drug Ketamine respectively. The langurs though belonged to a wild troop were used to frequent the neighbourhood of Jogi Mahal in Ranthambhore. They spend a good deal of time taking shelter under and eating figs of a greatly branched banyan tree in front of Jogi Mahal where some forest staff camp regularly.

Jogi Mahal is also frequented by hundreds of tourists from near and far. Besides, Ranthambhore fort is visited by thousands of pilgrims who come to worship the deities installed on the temples atop. Due to this constant interaction with humans this troop was not at all shy of humans. The local forest staff feed these langurs quite often. We could see that they would unhesitatingly pick up food from the palms of the staff. After the langurs were lured by generous offerings of *Roti* (wheat bread) and black roasted gram (*chana*) they came near people on ground. During such one moment the leader of the troop, a very well grown stocky male, was swiftly darted by Dr. Seal with a syringe fitted on a walking stick. The male looked around curiously but soon resumed eating without leaving the place or changing the sitting posture. Soon he started losing voluntary control and within 8 minutes of darting Dr. Seal could pat the animal without any protesting response from it. It kept seating throughout the period between darting and recovery.

Table 5

Drug dosage tried on spotted deer or Cheetal (*Axis axis*)
 Sl. No. 1 & 2 tried by Dr. Amladi in Dec. 1975 in a captive herd in Bannerghata Park
 (Karnataka). Rest by Dr. Seal in April 1976 in Sawaimadhopur.)

Sl. No.	Sex	Drug tried and its dosage	Induction time	Antidote and dosage, if any	Recovery time	Remarks
1	2	3	4	5	6	7
1.	Male Adult in antlers	Succinylcholine Chloride-6 mg	8 min.	No antidote given	56 min.	Animal was part of a captive herd of 25 Cheetal. Breathing regular throughout. Penicillin injected as a prophylactic. Estimated Wt. 60 kg. Eartag put.
2.	Female Adult	Succinylcholine Chloride-5 mg	15 min.	do	65	Estimated Wt. 50 kg. other remarks same as for Sl. No. 1
3.	Male Adult with big antlers	1st dose CI 744-25mg at 0921 hrs. 2nd dose CI 744-500mg at 0929 hrs. For recovery, prophylaxis and relaxation-injected by hand	5 min. (0921-0926)	No Antidote given	About 3 hours	Within 10 mts. of the animal going down immobilised it was carried to a shady place 100-150 metres away. After sometime the body made violent movements and it hurt itself not seriously. Legs tied with rope. Antlers held by 2 men. Recovery very difficult after a variety of treatments. Radio collar fixed. Additional dose of 50 mg. CI744 was given intramuscularly, by hand, when the animal tried to get up.
			Sodium bicarbonate 25 cc at 0941 Combiotic 10 cc at 1010 Atropine 1 cc at 1126 (=0.64 mg atropine) Sodium bicarb. 25 cc at 1142 Benadryl 3 cc do			

Table 5—(Contd)

1	2	3	4	5	6	7
		By mouth (i) (ii)	Water—2 litres at 1300 hours Azium (steroid compound) 6 mg & salt 50 gms mixed in 1/4 litre of water			The animal appeared intractable till the local Wildlife Warden Fateh Singh Rathore suggested giving water which was promptly done with the help of an empty bottle of Coca-cola. It then got up.
4. Male Adult with small branched antler	Rompun M 99 Atropine	50 mg 3 mg 1 cc	5 min. (1750-1755)	6 mg	(Not noted about 2 mts given at 1758)	The animal was overdosed, perhaps double the required dose as Dr. Seal stated. It started sinking very fast and hence the antidote given before radio-collar could be fixed. Then held by 6 men for fixing neckcollar, taking measurements etc.
5. Female Adult	Rompun M 99 Atropine	25 mg 1 mg 1/2 cc	14 min. (1835-1849)	2 mg	2 min. (1859-1901)	Was not fully unconscious when fell down. One man sat on her chest. Breathing regular. 150 mg Oxytetracycline and 5 cc Combiotic injected separately intramuscular.

The rest of the troop did not appear to be much concerned about the plight of their leader nor did they leave the place. They were all perched atop the banyan tree. Perhaps the sitting posture of the leader could account for this unconcern. At one point, however, after the leader had partially recovered and climbed the small platform constructed under the tree for sitting of the visitors, a lower ranking male approached him, held the former's head in two hands and shook it not slowly for a few seconds !

The same unconcern was shown by the troop when the female was darted in the same manner as for the male. The female was sitting on small branch of tree that was within the darting distance of the stick. It kept sitting all along till the drug took effect and after three minutes of darting it was brought down and placed on ground lest it may fall from the tree and injure itself. While she was being brought down some of the troop did make a distressing noise but no sooner did she was sit on ground the noise subsided.

For primates, Dr. Seal said, Ketamine was the drug of choice as it could be given even 2-3 times the required dosage and still it would be safer for the drugged animal. There is no antidote for this drug and perhaps not required either in normal situations.

The drug dosage etc., is given in Table 6.

Wild Boar (*Sus scrofa*).

Only one animal, a female, fully grown with small tusches protruding outside, was darted from about 20 metres near a small lake about 3-4 kilometres from Jogi Mahal as it was moving away after drinking water. It was late evening and the dusk was fast approaching. The drug used was CI744 with 1 cc of atropine mixed. The animal must have run about 200 metres before falling down. The dart which was not barbed had fully penetrated the muscles but at a slanting angle so as not to cause any rupture of vital organs. The animal did not revive within an hour of the darting. We left the place as it had already become dark. A radiocollar was fixed around her neck and ear-tags fitted. No antidote was given as a specific one is not yet found out. When we checked the spot next day the animal appeared to have left the place.

Other Animals

As per the planned programme, some more species were to be tried during Dr. Seal's visit which was a truly fruitful training programme in the use of tranquilising techniques. The programme was unique in as much as it was the first of its kind arranged anywhere. However, the shortage of time did not make it possible to try some more species in the forest conditions. If more time would have been available, perhaps he would have been able to tranquilise a wild elephant also. In the Chilla forests near Hardwar in Uttar Pradesh he had darted two male elephants on three occasions. One male who was darted twice was a big tusker. While the first dose given in the morning was too small to be

Table 6.

Drug dosage tried on Langur (*Presbytis entellus*) and Wild boar (*Sus scrofa*) by Dr. Seal in Sawai Madhopur forests in April 1976

Sl. No.	Species and Sex	Drug tried and its dosage	Induction time	Antidote if given	Recovery time	Remarks
1	Langur Male adult leader	Ketamine-- 60 mg (6/10 cc)	8 min. (0605-0613)	Not given	Full recovery about 1 hr. (not noted)	The drug was darted manually by fitting the syringe on the end of a walking stick. At 0613 Dr. Seal could pat and at 0615 lift him. Kept sitting throughout till at 0630 it succeeded in climbing a 1½ ft. high platform nearby. At 0635 it could not climb up a breach 3 feet overhead.
2	Langur Female adult	Ketamine-- 50 mg (½ cc)	3 min. (0625-0628)	-do-	(not noted)	It was darted as in the above described manner while it was sitting on a branch about 8' above ground. After 3 min. of darting it could be brought down by a man. Dr. Seal said the greatest depth of tranquilizing is obtained after 20 min. and recovery to normal state after 50 min. of darting ketamine. We left the langur at 0636 hours.
1	Wild boar Female Adult	CI744--200 mg Atropine-- 1 cc	3 min. (1916-1919)	Not given	Did not recover at least in 1 hr. when we left the site.	The dart, which was not barbed went fully in the muscles. The dart hole was covered with plastic tapes available. It had left the site as checked next day. Radio-collar and eartags put. 5 cc COMBIOTIC and 3 cc OXYTETRA-CYCLINE injected intramuscularly.

effective, the second one did not enter the body as the drug fell down due perhaps to a skin-plug blocking the needle of the syringe preventing injection of the drug. The syringe itself came out loose in two parts. The second male, also a tusker, was darted from within a distance of about 20-30 metres from the back of a domestic elephant also proved ineffective. The elephant bolted away in the dense forest around after the dart hit him. The barbed dart could be seen attached to its body as it ran. Efforts to locate it for the next half an hour from an elephant back proved unfruitful.

In Sawai Madhopur forests Dr. Seal had already filled dart-syringes with drugs for trying on chinkara (*Gazella gazella*) and jackal (*Canis aureus*) but the opportunity never arrived for using them.

Conclusion

The results already obtained from the field trials on immobilisation of Indian mammals are adequate to provide a reliable guideline for planning future similar programmes. The use of this technique as a scientific tool for making behavioural studies and investigating diseases among wild populations (Sinha, 1975; NCA, 1975) is something which can be delayed only at the peril of the already depleted wildlife of the country. In Dr. Amladi, and a band of trained wildlife managers that underwent training under Dr. Seal we already have a nucleus of workers who could initiate further trials in field. There are a number of dart-guns and pistols existing in the country with various zoos and Forest and Wildlife organizations. The most urgent need in this field for us is to have a supply of required drugs. This should not prove a deterrent as most of the drugs tried so far are manufactured by the reputed multinational pharmaceutical firms many of which have their branches in India.

Acknowledgements

The author expresses his sincere gratitude to Dr. Seal who unstintingly gave us the benefit of his expertise and experience. Thanks are due to the authorities of the Forest Research Institute and the Indian Forest College, Dehra Dun, and the Project Tiger, New Delhi without whose help the participation in the training programme would have been an impossibility. The drug dosages were also compared with that noted by Shri M.F. Ahmed, Lecturer, Indian Forest College who also participated in the training programme. His co-operation is thankfully acknowledged.

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APPENDIX—1

Drug data for Some Wild mammals as suggested by Dr. Ulysses S. Seal

Species	Common Name	Wt. Range (kg.)	Drugs and Dosages
1	2	3	4
1. PROBOSCIDEA			
<i>Elephas maximus</i>	Elephant	2500-5000	(1) M-99, 1 mg/foot height at shoulder + 15-25 mg Acepromazine. (2) Rompun, 0.08-0.14 mg/kilo.
2. PERISSODACTYLA			
<i>Rhinoceros unicornis</i>	Indian rhino	2000-4000	(1) M-99, 1.5-2.5 mg total.
<i>Rhinoceros sondaicus</i>	Javan rhino	800-2000(?)	(1) Same as above (?)

APPENDIX-I (Contd.)

Drug Data for Some Mammals

1	2	3	4
<i>Didermoceros sumatrensis</i>	Two-horned rhino	1000-2000(?)	(1) Same as above (?)
<i>Equus hemionus</i>	Asiatic wild ass	-260	(1) M-99, 1.5-4.0 mg. (2) Rompun, 1-2 mg/kg.
3. PRIMATES			
<i>Hylobates hoolock</i>	Gibbon or Hoolock	5-8	(1) Ketamine, 10-15 mg/kg (+ 0.5 mg/kg promazine) (2) Sernylan, 0.7-1.0 mg/kg + 0.5-1.0 mg/kg promazine.
<i>Macaca</i> sp.	Macaques	6-13	(1) Same as above.
<i>Presbytis</i> sp.	Langurs	7-18	(1) Same as above.
<i>Nycticebus coucoug</i>	Loris	0.5-1.5	(1) Same as above.
4. PHOLIDATA			
<i>Manis crassicaudata</i>	Pangolin	4.5-27	(1) Sernylan, 0.8 mg/kg + 0.5 mg/kg promazine. (2) Ketamine, 10 mg/kg.
5. CARNIVORA			
(a) CANIDAE			
<i>Canis</i> sp.	Wolf, Jackal	-75	(1) Sernylan, 1 gm/kg + promazine 1 mg/kg. (2) Ketamine, 10 mg/kg (+ promazine 1 mg/kg).
		-15	NOTE: If convulsions occur, Valium 10 mg;
<i>Vulpes</i> sp.	For	6-9	(1) Same as above.
<i>Cuon alpinus</i>	Dhole	14-21	(1) Same as above (?).
(b) URSIDAE			
<i>Ursus arctos</i>	Brown bear	150-250	(1) Sernylan, 0.8-1.0 mg/kg + promazine 0.5-1.0 mg/kg.
<i>Melursus ursinus</i>	Sloth bear	50-135	(1) Same as above.
<i>Selenarctos thibetanus</i>	Himalyan bear	60-120	(1) Same as above. NOTE: If convulsions occur, Valium 10-20 mg.

APPENDIX I-(Contd.)
Drug Data for Some Mammals

1	2	3	4
(c) PROCYONIDAE			
<i>Ailurus fulgens</i>	Red panda	3-4.5	(1) Sernylan 0.8-1.0 mg/kg + 1.0 mg/kg promazine. (2) Ketamine 10-15 mg/kg.
(d) MUSTELIDAE			
<i>Lutra</i> sp.	Otter	4.5-14	(1) Sernylan 1.0-1.2 mg/kg + 1.0 mg/kg promazine. (2) Ketamine 10-20 mg/kg.
<i>Aonyx cinerea</i> (<i>Amblonyx</i>)	Clawless otter	2.7-5.4	(1) Same as above.
<i>Martes</i> sp.	Martens	0.6-2.0	(1) Same as above.
<i>Mustela</i> sp.	Weasels	0.04-0.28	(1) Same as above.
<i>Vormela peregusna</i>	Polecat	0.6-0.8	(1) Same as above.
<i>Melogale</i> sp.	Ferret badger	1-2	(1) Same as above.
<i>Arctonyx collaris</i>	Hog badger	7-14	(1) Same as above.
<i>Mellivora capensis</i>	Ratel		(1) Same as above.
(e) HYAENIDAE			
<i>Hyaena hyaena</i>	Striped hyaena	27-54	(1) Sernylan 0.8-1.0 mg/kg + 1.0 mg/kg promazine.
(f) VIVERRIDAE			
<i>Viverra</i> sp.	Civets	2-4 (lesser) 7-11	(1) Sernylan 1.0 mg/kg + 1.0 mg/kg promazine. (2) Ketamine 15-20 mg/kg + 0.5 mg/kg promazine.
<i>Paradoxurus hermaphroditus</i>	Toddy cat	1.5-4.5	(1) Same as above.
<i>Paguma larvata</i>	Palm civet	3.6-5	(1) Same as above.
<i>Arctictis binturong</i>	Binturong	9-14	(1) Same as above.
<i>Prionodoe linsang</i>	Spotted linsang	0.5-0.8	(1) Same as above.
<i>Herpestes</i> sp.	Mongoose	0.5-3.5	(1) Same as above.
<i>Arctogalidia trivirgata</i>	Palm civet	2-2.5	(1) Same as above.

APPENDIX-I (Consd.)

Drug Data for Some Mammals

1	2	3	4
(g) FELIDAE			
<i>Felis</i> sp.	Cats	3-12	(1) Ketamine 10-20 mg/kg (+ 0.5 mg/kg promazine.)
<i>Neofelis nebulosa</i>	Clouded leopard	15-24	(1) Ketamine 10-15 mg/kg. (2) Sernylan 0.8-1.0 mg/kg + 0.5 mg/kg promazine. (3) CI-744 3 mg/kg.
<i>Acinonyx jubatus</i>	Cheetah	50-65	(1) Same as above.
<i>Panthera uncia</i>	Snow leopard	23-41	(1) Same as above.
<i>Panthera tigris</i>	Tiger	150-270	(1) Same as above.
<i>Panthera leo</i>	Lion	160-230	(1) Same as above.
<i>Panthera pardus</i>	Leopard	60-140	(1) Same as above.
6. CHIROPTERA	Bats		(1) Restraint. (2) Gas anesthetic.
7. INSECTIVORA	Shrews, Moles, Hedgehogs	0.3-1.5	(1) Gas anesthetic. (2) Ketamine ∞ 10 mg/kg.
8. RODENTIA	Rats, Mice, Squirrels, Porcupine, Gebril	0.02-20	(1) Gas anesthetic. (2) Ketamine 5-15 mg/kg. (3) Restraint.
9. LAGOMORPHA	Hares	0.5-3.0	(1) Gas anesthetic. (2) Ketamine 10-20 mg/kg.
10. ARTIODACTYLA			
(a) SUIDAE			
<i>Sus scrofa</i>	Wild boar	75-200 ♂ 35-150 ♀	(1) Sernylan 1.0-2.0 mg/kg + 1.0 mg/kg promazine.
(b) BOVIDAE			
ANTILOPINAE—			
<i>Antelope cervicapra</i>	Blackbuck	25-40	(1) Rompun 50-75 mg. (2) CI-744 200 mg.

APPENDIX-I (Cnntd.)

Drug Data for Some Mammals

1	2	3	4
<i>Gazella gazella</i>	Chinkara	20-35 (?)	(3) Succinylcholine 4 mg. (1) M-99 1.5 mg (?). (2) Rompun 1 mg/kg.
BOVINAE—			
<i>Bos gaurus</i>	Gaur	~600-1000 ♂ ~450-700 ♀	(1) M-99 5-7 mg ♀ 8-10 mg ♂ + 10-25 mg Acepromazine.
<i>Bos banteng</i>	Banteng		(1) M-99 4-7 mg + 10 mg Acepromazine. (2) Rompun 1-1.5 mg/kg.
<i>Bos grunniens</i>	Yak	450-525	(1) M-99 4-6 mg.
<i>Bubalus bubalis</i>	Buffalo	700-825	(1) M-99 5 mg + 10 mg Acepromazine. (2) Rompun 0.3-0.6 mg/kg (not for capture). (3) Sernylan 0.5-1.0 mg/kg + 0.5 mg/kg promazine.
<i>Boselaphus tragocamelus</i>	Nilgai	175-240	(1) M-99 4 mg + 50 mg Rompun.
<i>Tetracerus quadricornis</i>	4-Horned Antelope	17-21	
(b) BOVIDAE CAPRINAE			
<i>Budorcas taxicolor</i>	Takin	230-275 (?)	
<i>Capra sp.</i>	I bex, Goat,	75-120 ♂	(1) M-99 ~ 1.0 mg + 5.0 mg Acepromazine.
	Markhor	50-60 ♀	(2) Rompun 0.1-1.0 mg/kg.
<i>Capricornis sumatraensis</i>	Serow	50-100	
<i>Hemitragus sp.</i>	Tahr	70-100	(1) M-99 4-5 mg.
<i>Nemorhaedus goral</i>	Goral	22-32	
<i>Ovis sp.</i>	Sheep, Shapu, Nayan	75-200	(1) M-90 2-4 mg total (use 1.5" long needles).

APPENDIX-I (Contd.)
Drug Data for Some Mammals

1	2	3	4
			(2) Rompun 1-2 mg/kg.
<i>Pantholops hodgsoni</i>	Tibetan antelope	40-50	
<i>Pseudois nayaur</i>	Bharal	55-75	
(c) CERVIDAE			
<i>Axis axis</i>	Chital	50-80	(1) Sernylan 0.8 mg/kg + 1.0 mg/kg promazine. (2) M-99 (3) Succinylcholine 0.1 mg/kg.
<i>Axis porcinus</i>	Hog deer	36-45	(1) Same as above (?).
<i>Cervus duvauceli</i>	Swamp deer (Barasingha)	125-200	(1) M-99 5 mg + Rompun 100 mg (5-8 mg M-99 alone). (2) Rompun 3 mg/kg. (3) Succinylcholine 0.12-0.15 mg/kg (max. 20 mg.). (4) Sernylan 0.7 mg/kg + 1.0 mg/kg promazine.
<i>Cervus elaphus hanglu</i>	Kashmir stag	150-200	(1) Same as above (?).
<i>Cervus eldi</i>	Thamin	110-180 (?)	(1) Same as above (?).
<i>Cervus unicolor</i>	Sambar	150-250	(1) Same as above.
<i>Moschus moschiferus</i>	Musk deer		(1) 25 mg Rompun + 1 mg M-99
<i>Muntiacus muntjak</i>	Muntjac		(1) Restraint. (2) Promazine or Rompun 0.2-0.5 mg/kg.
(d) TRAGULIDAE			
<i>Tragulus meminna</i>	Chevrotain	2-5	(1) Restraint.
11. CETACEA	Whales, Dolphins	75-50,000	(1) Restraint.
12. SIRENIA	Dugong, Manatee	140-170 140-360	(1) Restraint.
13. PINNIPEDIA	Seals, Sea lion, Walrus	90-1300	(1) Sernylan 0.2-0.8 mg/kg + Diazepam 10-40 mg. (2) Restraint.

APPENDIX-I (Contd.)

Drug Data for Some Mammals

1	2	3	4
14. EDENTATA	Sloths, Ant-eaters, and Armadillos	0.5-23	(1) Sernylan 1.0 mg/kg + 0.5 mg/kg promazine.
15. TUBULIDENTATA	Aardvark	50-70	(1) Sernylan 0.8-1.0 mg/kg + 0.5 mg/kg promazine.
16. DERMOPTERA	Flying lemur	1-1.8	(1) Restraint. (2) Gas anesthetic.
17. HYRACOIDEA	Hyrax	1.5-2.5	(1) Sernylan 1 mg/kg + 0.5 mg/kg promazine.
18. MARSUPIALIA	Kangaroos, Possums	0.1-67	(1) Sernylan 0.8 mg/kg + 0.5 mg/kg promazine.
19. MONOTREMATA	Echidna Platypus	2.5-6.0 0.5-2.0	(1) Sernylan 0.6 mg/kg. (2) Ketamine (?) (3) Gas anesthetic.

APPENDIX-2

Finally recommended drug data by Dr. Ullyses S. Seal for *Nilgai*, *Sambar*, *Chital* and *Langur* as communicated in his letter of June 22, 1976 sent to Mr. N.R. Nair, Deputy Director, Project Tiger, Government of India, New Delhi.

I. *Nilgai and Sambar*—Adult male and female

- a. M-99—3.0 mg b. Rompun—50.0 mg c. Atropine—0.4 mg
Antidote: M 50—50 ...6.0 mg

II. *Chital*—Adult Male and Female

- a. M 99—1.0 mg b. Rompun—25.0 mg c. Atropine 0.2 mg
Antidote: M 50—50—2.0 mg

III. *Langur*

Ketamine—50.0 mg*

*This is a light, short-term immobilization dose. For deeper anesthesia, the dose could be increased up to 100 mg for adults.

All of these doses are for full grown adults and would be decreased proportionately for younger animals.

APPENDIX 3

Pharmacological formula of some of the drugs used for tranquilization of animals

Name of the Drug	Pharmacological formula
1. Rompun (xylazine)	2—(2, 6-xylidine)-5, 6-dihydro-4H-1, 3 thiazine hydrochloride.
2. Sernylan (Phencyclidine Hydrochloride; Sernyl CL395 or GP-121)	1—(1-phenylcyclohexyl) piperidine hydrochloride.
3. Ketamine (Ketalar, Ketanest, Vetalar (CI581)	2—(0-Chlorophenyl (Methylamino) Cyclo hexanone-hydrochloride.
4. M99 (Etophine hydrochloride)	6, 14 endoetheno-7a-(1-(R)-hydroxy-1-methylbutyl)- tetrahydro-oripavine hydrochloride.
5. CI744	2-(ethylamino)-2-(2-thienyl) cyclohexanone hydrochloride.

Comments by Dr. S.R. Amladi (Pers. Comm).

I had sent the drug data presented in the tables 2 to 6 to Dr. Amladi for his comments and indicating the present position regarding the availability of various drugs mentioned. He has observed, "Concerning my own trial, the short report of which you have perused, I feel it is only a preliminary one with a drug easily available in India, and

one which has wide usage. As pointed out in the last paragraph of my report, its usefulness in the field on a larger scale is still to be tested.

"I have gone through the tables of data you sent. I notice that in most cases a combination of two drugs has been used, especially Romun and M-99. The antidote M-50-50 is effective only against M-99. Perhaps the need for such a combination may be outlined. I think it is better to indicate the dose of Atropine in milligrams rather than in cc. since this will reveal the exact amount given in terms of weight of the drug. I wonder if you found any sedation or incoordination in the animals given Rompun which produces sedation of several hours' duration".

Whereas we will have to wait for Dr. Seal's reply regarding the need for using a combination of drugs I may state that we did not follow animals as they rose and ran away after the antidote was administered and it is not therefore possible to say if any incoordination developed once they vanished from sight. The concentration of atropine in terms of weight was 0.64 mg per cc.

Regarding availability of the drugs Dr. Amladi replied in his letter:

"*Succinylcholine* is available for use in human surgical practice and is marketed under the trade name of *Midarine* (Burroughs Wellcome & Co.) in vials of 10 cc containing 50 mg per cc.

"*Rompun* (Bayer Ltd.) is not available in our country but is marketed in Europe and USA for veterinary use in cattle and horses only.

"M-99. It is one of the most powerful narcotics belonging to the morphine class of drugs, chemically called Etorphine—a most dangerous drug to handle for the investigator since it is not less than 5000 times more powerful than morphine. For this reason it will naturally be under the strictest of regulations under the laws of our country.

"Sernylan and Ketamine are both made by Parke-Davis & Co. The former is only for veterinary use and not available here. Ketamine is however available here and is used in our medical practice as an anaesthetic. It is rather expensive."

Special thanks are due to Dr. S.R. Amladi for his comments as also to Dr. Madhav Gadgil, Institute of Science, Bangalore and Shri K.T. Ganapathi, Dy Director, Project Tiger, Bandipur Reserve.

REPRINT FROM CHEETAL—NOVEMBER 1968

"On the 22nd of October 1968 a tiger was caught in a gin-trap in KALUWALA Shooting Block of Shivalik Forest Division (Saharanpur, U.P.) and a sportsman member of Wild Life Preservation Society reported the incident to the Wild Life Warden Shri R.S. Bhadoria I.F.S., who immediately procured a tranquiliser equipment called 'Capchur' gun first marketed by Palmer Equipments of U.S.A. There was some delay as the equipment had to be got from the Chief Wild Life Warden, Uttar Pradesh, Lucknow.

The Wild Life Warden with his staff, a Veterinary Surgeon and a local Sportsman approached the trapped tiger on elephant back.

Two Syringes charged with 3 mg of nicotine (Standardised alkaloidal nicotine) per kg body weight, on a body weight calculation of 500 lbs. was fired from a range of 15 metres. The first one missed the target but the second one hit the tiger on the hip and discharged its contents.

The moment the drug, which initially acts as a stimulant and renders the body insensitive to pain before completely immobilising the animal, became active in the circulatory system, the tiger, in excitement, managed to pull out its trapped paw, and after making a fient at the elephant, escaped into the forest. The tiger was seen running by the warden's party, "using all its four feet equly well, giving no sign of limp". According to the wardens, he then "searched the trap area, and the trap left behind, which also confirmed that no portion of the trapped part got amputated. Of course, minor abrasions can not be ruled out".

Three weeks have elapsed since this incident, and no news of human kills has come, so the tiger may be deemed to have reverted to normal. The warden and his staff are keeping track of this tiger which, they report, they have "seen twice since then".

Only Thomas in 1961 has given figures for the use of tranquiliser drugs on tiger, probably in captivity, and he was using succinyl choline chloride at between .75 to .92mg/kg body-weight, but this drug is more potent than nicotine.

It would have been even more interesting from the academic point-of-view if the tiger had become immobilised and had not released itself in the convulsions and excitation which are the immediate, short-term effect of nicotine injection. Dr. Arora would then have administered medical aid to the sedated tiger if at all it was needed, before releasing it.

In any case, the 'Cap-Chur' gun purchased at much expense by the Wild Life Organisation, U.P., has been used for the first time in such a case. Much more work should be done on techniques of tranquilisation, as very little of it has been done in India so far. In this respect, this is a pioneer attempt, and we will look forward to receiving the full report, which should encourage further work in this field."

Tiger clearing the forest floor of dry leaves before bedding down

I visited Corbett National Park in connection with a Man and Biosphere project in the month of March, 1976. Gairai was one of my places of halt, where I camped in the Forest Rest House. My work included early morning bird walks in the adjoining forest areas. On March 24th I started on my daily tramp at sun rise. The forest road was densely carpeted with a thick lair of dry leaves. The dry leaves made loud cracking noise when stepped on. I was finding it rather difficult to walk noiselessly. At a bend in the road I was surprised to see a clear, oblong patch of about a metre in length which had been cleared of the dry leaves. The ground was soft and dry and the impression of a hairy animal having rested there was very clear. In order to get a clue of identity of the animal who had bedded at the spot I made a careful examination of the patch for the fallen hairs and the pug or hoof marks. I could not find any fallen hairs although their impression in the soft earth was quite clear. My efforts were rewarded by the discovery of only half a pug-marks of a full grown tiger near the anterior edge of the oblong. I had read and heard about tigers basking in the sun on rocks, hiding in thickets or patches of bushes and undergrowth during day time, lying in wait of prey in tall grass and some time even basking in a grassy patch. But I had never before read or heard of a tiger clearing the ground before bedding down. And yet, that was exactly what I was looking at. The spot being a bend in the forest road and slightly on a rise, commanded a good view on both sides of the seldom-used road which had perhaps taken over the role of a game track. I proceeded with my bird walk after having made a mental note to check up this point from the existing literature or by discussion with the Tiger Project personnel residing in the park. The very next day I had to go to Dhikala to consult Dr. Salim Ali's Hand Book which is available in the park's wildlife warden's library. While sitting in the reception office, I overheard a foreigner talking excitedly about having seen a tiger's kill while on an elephant ride. Curiosity got the better of me and I butted in on the conversation. On formal introduction the foreigner turned out to be Prof. S. Edmund from Austria who had come to India to make a short educational film on tigers. He had already visited 3 of our Tiger Reserves in India. I asked him the question which was upper-most in my mind since yesterday. Had he ever come across an instance where a tiger had swept off the forest floor to get rid of dry leaves before bedding down? He informed me that he had noticed such a thing that very morning near the kill. I expressed a desire to see the spot and requested the receptionist to call the particular Mahavat who had accompanied Prof. Edmund. The Mahavat was summoned and Prof. Edmund also very kindly volunteered to show me the spot. While we waited for

the Mahavat to turn up Shri M.A. Khan of the Tiger Project materialised with the pug-marks-tracing kit, apparently intent to visit the same spot to trace the pug-marks of the tiger who had made the kill. The four of us proceeded by Jeep to a spot, on the edge of the thick forest, nearest to the kill. Both the Mahavat and Prof. Edmund started searching for the spot where they had located the kill in the morning. They had, apparently, marked the spot by a very big and tall *Sal* tree near a small clearing. Now every 10th tree appeared big and tall, and near a clearing. The Mahavat in the meanwhile had resorted to the good old tracking technique i.e., moving round in circles increasing the diameter every time. Ultimately it was he who gave us a shout of discovery. All the details of the gory drama lay sketched there on the ground. We could locate the spot with marks of struggle of the dying animal and blood on the leaves below. From there on the drag marks to the place where he ate the first meal were very clear. The spot where the meal was partaken was marked by blood stains, entrial contents and the uneaten pelvic girdle of the stag. The tiger had, apparently, rested after the meal in a patch of thick undergrowth about 10 metres away from the kill. Here again the fallen dry leaves, with which the forest floor was unevenly covered, had been swept aside. The patch was about a metre in length and was about $\frac{3}{4}$ metres in width. The ground was not very soft. There were a couple of pug-marks on the edges of this patch but they were rather faint, though fresh. After having seen the antlers and the jaw bones, which was the only portion of the stag left uneaten by the tiger, a little further away, we returned to Dhikala. There I asked again from a number of Wild Life Guards, Asstt. Wild Life Warden and field personnal of the Tiger Project if they had ever noticed a tiger clearing the ground of dry leaves before bedding. None of them had ever come across such an instance. Through your esteemed journal I would like to request naturalists and experienced shikaris to throw more light on the bedding habits of the tiger.

Zoological Survey of India,
Northern Regional Station,
Dehra Dun (U.P.).

B.S. Lamba

वन्य-जीव संरक्षण

लेखक

हरी प्रकाश अग्रवाल

भारतीय प्राणि सर्वेक्षण विभाग, १५४४-ए-नेपियर टाऊन, जबलपुर

भारत एक विशाल देश है, जिसका क्षेत्रफल बहुत विस्तृत है। देश के बहुत अधिक विस्तृत होने के कारण एवं विभिन्न प्रकार की जलवायु के समावेश होने के फलस्वरूप वन्य-प्राणियों में बहुत अधिक विविधता पाई जाती है।

भारत को वन और उसकी उपज पैतृक सम्पत्ति के रूप में प्राप्त है। वन या जंगलों से वानस्पतिक पदार्थ ही उपलब्ध नहीं होते, परन्तु उनमें विचरण करने वाले पशु-पक्षी भी सम्मिलित हैं—ये वन्य-जीव एक अमूल्य निधि हैं, जिनका अपना अलग अलग महत्व व स्थान है—ये आर्थिक दृष्टि से भी बहुत महत्वपूर्ण हैं। हमारा ज्ञान इन जन्तुओं के स्वभाव व क्रिया-कलापों के विषय में बहुत अपूर्ण व सीमित है। देश में जंगली जंतु अनेकों कारणों से प्रतिदिन अपनी जीवन-लीला समाप्त करते जा रहे हैं। भारती ही नहीं अपितु सम्पूर्ण विश्व से बहुत से जीव-जन्तुओं की बहुत सी जातियाँ लुप्त होती जा रही हैं। हमारी बहुत सी अमूल्य व लुभावनी सम्पत्ति पूर्णतया लोप या समाप्त हो चुकी है। इस शताब्दी में लगभग ७० वन्य-प्राणियों की जातियाँ विश्व से समाप्त हो चुकी हैं—चीता अब केवल चित्रों में ही देखने को मिलता है। इस कारण यह परमावश्यक है कि इनकी सुरक्षा या संरक्षण के विषय में भी कुछ प्रकाश डाला जाय।

संरक्षण का तात्पर्य है कि इन जन्तुओं की वांछित संख्या में कमी न हो। देश में राजाओं ने भी पशुओं की सुरक्षा के नियम बनाये; जिससे इनके संरक्षण में योगदान मिला। इस बहुमूल्य सम्पत्ति को बचाने हेतु शिकार कानूनों में भी संशोधन किया गया है, परन्तु इसमें जनता का सहयोग भी बहुत आवश्यक है।

एक समय था जबकि मनुष्य प्रकृति के साथ समन्वय से रहता था; उसको यह आभास था कि वन्य निधि उसके जीवन को प्रसन्न व आनन्दमय रखने के लिये परमावश्यक वस्तु है; मनुष्य यह भूल जाता है कि प्रकृति के साथ उसका कितना अटूट सम्बन्ध है? वन्य प्राणियों के लोप या समाप्त हो जाने से अन्य हानियाँ भी बहुत गंभीर व हानिकारक हैं—जैसे कि आर्थिक। इन सुन्दर व विविध वन्य-प्राणियों के कारण पर्यटकों के लिये और महत्व बढ़ जाता है।

समय के व्यतीत होने के साथ-साथ बढ़ती हुई आवश्यकताओं ने प्रकृति पर कृत्रिम अधिकार प्राप्त करने के लिये भूमि तथा वन्य निधि का कृपणता, असावधानी तथा असन्तुलित ढंग से प्रयोग किया, जिसके फलस्वरूप बाढ़ या सूखे का प्रकोप, भूमि कटाव हुये तथा पृथ्वी की शक्ति क्षीण हो गई। परन्तु हम यह जानते हैं कि जन्तुओं पर प्रजन्त स्थान, आवास व भोजन में कमी की बहुत बड़ी प्रतिक्रिया होती है। वन्य-प्राणियों का किसी भी वन या जंगल में निवास करना उनके भोजन सम्बन्धी स्वभाव व वहाँ के वातावरण के अनूकूल होने पर निर्भर करता है। इस शताब्दी के प्रारम्भ में जंगल इतने अधिक घने व जटिल थे कि कोई मानव मात्र उसमें से बहुत ही कठिनाई

से विचरण कर सकता था। परन्तु आज जंगल नष्ट हो गये हैं और लगभग घास के मैदान के समान प्रतीत होते हैं। वनों या जंगलों में वृक्षों के कट जाने के फलस्वरूप जल की उपलब्धि भी प्रभावित हुई है; छोटी वनस्पतियाँ भी कम हो गई हैं जन्तुओं के प्रजनन के लिये स्थान भी सीमित रह गया है। जन्तुओं का जीवन किसी न किसी रूप से वनस्पतियों पर आधारित है—यदि शाकभक्षी जन्तुओं के लिये पेड़-पौधे उपलब्ध नहीं होंगे जो वे समाप्त हो जायेंगे; इसी प्रकार माँस भक्षी जन्तुओं के लिये अन्य जंतु परमावश्यक हैं। वस्तुतः यह व्याख्या की जा सकती है कि जन्तुओं का जीवन पूर्ण रूप से वनस्पतियों पर आधारित है। ग्रीष्म-काल में भी चारे की कमी हो जाती है—जिसका प्रभाव मवेशियों पर पड़ता है जो कि वन्य-प्राणियों के लिये हानिकारक है। जंगलों का पुनरोत्थान व संरक्षण अत्यंत आवश्यक है; वनों का संरक्षण वन्य-प्राणि जाति के संरक्षण के लिये सर्वप्रथम आवश्यक बात है।

प्रकृति में वन्य-प्राणियों की एक निश्चित आबादी एक विशेष आवास में सीमित भोजन, जल, संरक्षण, रोग एवं शत्रु पर निर्भर करती है। यदि पर्याप्त मात्रा में भोजन व सुरक्षा प्राप्त हो तो उनकी आबादी में वृद्धि अवश्य होगी।

जंगलों के नष्ट होने के पूर्व यह आवश्यक है कि जन्तुओं को दूसरे समीपस्थ के जंगलों में प्रवेश करने के लिये स्थान प्राप्त हो सके। इसलिये, यदि आवास की कमी को पूरा किया जा सके, तो यह संभव है कि जाति नष्ट होने से बच जाय।

भोजन या चारे की कमी प्राकृतिक कारणों से भी हो सकती है जैसे कि सूखा या वर्षा का प्रकोप, अन्य जन्तुओं द्वारा बहुत अधिक चराई व आग का लगना। वन्य-प्राणि संरक्षण के लिये यह आवश्यक है कि जंगलों में आग लगने की पूरी सुरक्षा व सावधानी होनी चाहिये।

वन्य-प्राणियों के निवास स्थान में अन्य जन्तुओं के चरने के कारण वन्य-प्राणियों की आबादी में बहुत अंतर आ गया है। उदाहरणार्थ—मुदुमलाई सैंक्चुअरी में—मवेशियों की बीमारी रिडंडरेस्ट के फैलने के कारण गौर (Bison) का बहुत नाश हो गया। यह भी आवश्यक है कि रोगों के विषय में भी अध्ययन होना चाहिये कि कौन सी बीमारी किस जन्तु के लिये घातक है तथा उस पर कैसे नियन्त्रण किया जा सकता है।

बहुत से मनुष्य घन के प्रलोभन से अवैध शिकार करते हैं। ये शिकारी एक बड़ी संख्या में जंगली जन्तुओं का उनके माँस, त्वचा, सींग, बाल आदि के लिये शिकार करते हैं। गाँव के शिकारी कुत्तों की मदद से भी जंगलों में शिकार ढूँढ़ते फिरते हैं। इस प्रकार हजारों जन्तुओं का प्रतिवर्ष अवैध शिकार होता है—क्योंकि शिकार के कानून उचित प्रकार से प्रतिस्थापित नहीं हैं।

जनसंख्या में वृद्धि तथा आधुनिक अस्त्र-शस्त्रों के फलस्वरूप अवैधशिकार में बहुत अधिक वृद्धि हुई है। भोजन प्राप्ति व अनाविधिकार का अंतिम प्रभाव कमजोर जन्तुओं की उत्पत्ति का कारण है। अर्थात् यह भी कहा जा सकता है कि इससे बलिष्ठ संतति क्षीण ही नहीं होती वरन् उत्पत्ति में भी कमी हो जाती है।

वन्य प्राणियों का शिकार या नाश फसल को बचाने के लिये दिये गये हथियारों द्वारा भी किया जाता है। इसलिये फसल की रक्षा के लिये दिये गये बन्दूक की नाल १८" या २०" तक ही होनी चाहिये।

यह आवश्यक है कि विशेष अधिकारी की नियुक्ति होनी चाहिये जो अवैध शिकार को रोक सके। वर्तमान कानूनों के अंतर्गत अवैध शिकार के लिये और कठोर सजायें होनी चाहिये। वन तथा शिकार रक्षकों की संख्या और अधिक कर देनी चाहिये तथा अपराधियों को पकड़ने के लिये पारितोषिक भी रखने चाहिये।

जंगलों की सड़कों पर मोटर-गाड़ियों के चलने तथा खोज-बत्ती (Search Light) के प्रयोग पर प्रतिबन्ध होना चाहिये।

बहुत से पर-भक्षी भी दूसरे छोटे जन्तुओं का शिकार करते हैं। चीता, बाघ, जंगली कुत्ते आदि विशेष रूप से कमजोर जन्तुओं को नष्ट करते रहते हैं—इसलिये जंगली कुत्ते जैसे पर-भक्षी की रोकथाम के उपाय होने चाहिये।

विज्ञापन व प्रचार के द्वारा भी वन्य-प्राणियों के संरक्षण व आबादी के वृद्धि होने में मदद मिल सकती है। इस बात का प्रचार होना चाहिये कि मनुष्य को वन्य-प्राणि संरक्षण का महत्व समझाया जा सके। प्रचार के लिये और अधिक वन्य प्राणि संस्था या समिति स्थापित होनी चाहिये। एक प्रचार विभाग भी होना चाहिए जिसमें एक अधिकारी, एक कलाकार, एक फोटोग्राफर तथा एक मानचित्रक होना चाहिये—जो कि पोस्टर, पोस्ट कार्ड्स, चित्रों व इतिहास द्वारा प्रचार कर सकें। प्रचार समाचार-पत्रों व आकाशवाणी द्वारा भी किया जा सकता है। चिड़ियाघरों की भी स्थापना होनी चाहिये। विद्यालयों में विद्यार्थियों को वन्य-प्राणि व उनके संरक्षण के विषय में ज्ञान प्राप्त कराना चाहिये।

इसके अतिरिक्त वन्य-प्राणि सप्ताह के अंतर्गत वन्य-प्राणि संरक्षण के उपाय व लाभ से सम्बन्धित चल-चित्रों का प्रदर्शन होना चाहिये। प्रचार विधान सभा सदस्यों के द्वारा भी हो सकता है जो कि अपने अपने निर्वाचन क्षेत्र में संरक्षण के महत्व को फैला सकें। यदि जन-साधारण में जन्तुओं के प्रति स्नेह व कोमल भावना जाग्रत होगी तो उनका नाश होने से बचेगा।

यदि आवश्यक हो तो जन्तुओं को अन्य स्थानों से भी लाना चाहिये जिससे कि अवैध शिकार व नाशकी क्षति को पूरा किया जा सके।

उपरोक्त विवरण से यह ज्ञात होता है कि बहुत सी असावधानियों व बहुत सी बातों का बहिष्कार करने के फलस्वरूप बहुत क्षति हुई है। यदि वन्य-प्राणियों का बहिष्कार या दुरुपयोग किया गया तो अन्तिम रूप से मनुष्य को ही कष्ट उठाना पड़ेगा। इसलिये वनों व वन्य-प्राणियों का संरक्षण बहुत अधिक महत्व रखता है। हमारी क्रियाओं का प्रभाव केवल वर्तमान पीढ़ी पर ही नहीं पड़ेगा वरन् आने वाली पीढ़ी भी प्रभावित होगी।

वन्य-प्राणि व्यवस्था व संरक्षण के लिये १९५२ में वन्य-प्राणि समिति की स्थापना हुई। इस भारतीय वन्य-प्राणि समिति के फलस्वरूप देश में बहुत से पार्क संस्था व सेंकुरी स्थापित हुईं जिनमें अधिक से अधिक पशु-पक्षी सुरक्षित रह सकें। बहुत सी जातियों को समिति के उचित समय पर कार्यवाही द्वारा लोप होने से बचाया जा सका है।

मनुष्य सर्वनाश करना जानता है, परन्तु उसमें इतनी शक्ति व क्षमता नहीं है कि प्रकृति के किसी छोटे से जीव तक को पुनः जीवन प्रदान कर सके। मनुष्य मात्र के अपने परिवर्तन हुये स्वभाव के कारण ही पतन अवश्यंभावी है। स्वर्गीय पं० जवाहर लाल नेहरू ने कहा था “कि यदि हमारे पास में सुन्दर पशु-पक्षी देखने व खेलने के लिये

नहीं होंगे तो हमारा जीवन बहुत ही शुष्क व नीरस हो जायेगा”। वन्य-जीव संरक्षण के विचार से ही भारत में ३०० ईसवी पूर्व रचित “अर्थशास्त्र” में चाणक्य ने “अभयारण्य” का विधान रखा था जहाँ पशु-पक्षी बिना मनुष्य के भय के विचरण कर सकें। इसलिये हम सभी का परम धर्म व कर्त्तव्य है कि वन्य निधि का सामाजिक, नैतिक, आर्थिक, सांस्कृतिक, कलात्मक व जन-स्वास्थ्य महत्व को समझते हुये उसके विनाश से हर सम्भव प्रयत्न द्वारा रक्षा की जाय।

Dr. Salim Ali Receives Getty Conservation Prize

Dr Salim Ali, 79, India's celebrated ornithologist has been awarded the J. Paul Getty Wildlife Conservation Prize for 1975 in February in Washington, D.C. The prize was first established by Dr. Getty in 1974.

The Prince of Netherlands, President of the World Wildlife Fund chaired the International jury which selected Dr. Ali from 475 nominees from 53 countries. He has published over 200 scientific articles and six books, among them the ten volume book on birds which was coauthored with Dr. S. Dillon Ripley.

Dr. Ali led research into bird ecology and migration and world bird movements. He was awarded Padma Vibhushan in recognition of his work. This summer he is touring Puga Valley and other regions of Ladakh studying birds in their summer resorts.

प्रधान—मंत्री पक्षियों के बीच

भरतपुर पक्षी विहार

बो० स० सक्सेना

उपवन संरक्षक, जयपुर

फरवरी ८, १९७६, ऊषाकाल, भरतपुर पक्षी विहार, आगरा से लगभग ५० कि० मी० पश्चिम दिशा में । नव निर्मित 'फोरेस्ट लाज', जहाँ श्रीमती गांधी—प्रधान मंत्री ने ७ फरवरी की रात्रि में विराम किया ।

मुझे लगभग ५.४५ प्रातः स्थानीय वन अधिकारी ने आकर सूचना दी कि प्रधान मंत्री अब ७.३० बजे के बजाय ७.०० बजे ही भरतपुर पक्षी विहार भ्रमण पर निकल पड़ेंगी । मैं झटपट तैयार होकर समय से पूर्व ही 'फोरेस्ट लाज' पहुँच गया ।

श्रीमती गांधी समय से ५ मिनट पूर्व ही बरामदे में नीचे आ गईं । गुलाबी सलवार, काला ओवरकोट पहने, सचमुच प्रियदर्शनी लग रही थीं । तत्काल वे और उनके परिवार के कुछ सदस्य 'पोर्च' में खड़ी हरी मिनी बस में सवार हो गये । पद्मविभूषण डा० सालिम अली भी हमारे साथ थे । ज्योंही हम लोग कीकर वन से गुजर रहे थे सारस के एक जोड़े ने, ठीक हमारी गाड़ी के ऊपर उड़ते हुये अपने मधुर युगल गान की टेर छोड़ी, मानो वे भी प्रधान मंत्री का स्वागत कर रहे हों । श्रीमती गांधी उल्लसित होकर बोल उठीं कि प्रातः ५.३० बजे उन्होंने अपने कमरे में सारस की ही नहीं हंसों की भी आवाज सुनी थी । वातावरण शांत और मनोहारी था, मन्द मन्द समीर बह रही थी । हम लोग बकालय के पास पहुँचे ही थे कि जामुन और कदम के झुरमुटों से छन छन कर आते हुये प्रकाश ने सूर्योदय का आभास कराया ।

नौका बिहार :

बकालय पर उतर कर श्रीमती गांधी, डा० सालिम अली, मैं व एक अन्य अधिकारी एक 'फाईबर ग्लास' की नाव में बैठे जिसे हुक्मसिंह नाविक खे रहा था, अन्य दो नावों में शेष सदस्यगण हमारे पीछे पीछे आते रहे । झील के शांत नीले जल में जैसे ही नाव सरनी, चौकस प्रधान मंत्री ने विशाल झील की ओर दृष्टिपात करते हुये पूछ ही तो लिया कि क्या इसमें मगरमच्छ भी हैं । मैंने उत्तर दिया कि ५०० हेक्टर में फैनी यह छिछली झील केवल मानसून व सर्दी में ही पानी से भरी रहती है । गर्मियों में तो दो चार छोटे छोटे से पोखर ही रह जाते हैं । मगर वहाँ नहीं रह पाते ; अलबत्ता सन् १९६७ की बाढ़ में कुछ दिनों के लिये यहाँ एक मगर जहर आया था किन्तु उसके बाद कभी नहीं दिखा ।

रंग बिरंगी बतलें :

हमारी नौका शनैः शनैः आगे बढ़ रही थी, श्रीमती गांधी ने अब पक्षियों की रंगीन चित्रों वाली पुस्तक तथा जर्मनी वाली दूरबीन अपने 'बैग' से निकाल ली और चारों ओर प्रकृति की छटा देखने लगीं कि इसी पानी में गोता लगाती एक 'डुवडुवी' ('डेबचिक') पर उनकी निगाह पड़ी—इस जलपक्षी ने गोता लगाया और करीब ७ मीटर दूर जाकर निकला । प्रधान मंत्री की यह जानी पहचानी चिड़िया थी और वे गद्गद हो कहने

लगी कि ये पक्षी श्रीनगर में भी उनकी 'हाऊस बोट' (शिकारे) के पास देर तक उनका मनोरंजन करता था— कितना भोला, कितना फुर्तीला। ऐसा लगा कि वे अतीत की सुखद स्मृति में खो गई हैं। उनका ध्यान भंग किया साईबेरिया से आये कल हँसों के कलरब ने। कुछ कल हँस ("ग्रे लेग गीज") बीच में टापु पर अपनी मदमाती हंसगामिनी चाल से हमारी निगाहें अपनी ओर आकर्षित कर रहे थे।

नौका विहार क्षेत्र में मुर्गाबियों का विशेष जमघट था। हमारे सामने कस्थई सफेद सींखपर ("पिनटेल") तैर रहे थे तो पीछे मटमैले बेखुर ("गेडवाल") बाईं ओर गुलाबी मखमली गर्दन वाले लाल सिर ("रेड क्रेस्टेड-पोचाड") तो दाईं ओर सलेटी बदन वाले बुडार ("कोमन पोचाड") डुबकी लगा रहे थे। इधर काली घाड़ें ("कूट") और जल कौवे ("कोरमोरेन्ट") गोता लगा रहे थे तो उधर काली घवल काया पर चोटी धारण किये अबलक ("टपेटेड पोचाड") भी अपनी झलक दे, पानी में दूर निकल जाते थे। चारों ओर रंग बिरंगी जल मुर्गाबियों का साम्राज्य सा छाया हुआ था। आइं का उड़ना तो ऐसा लग रहा था मानों वायुयान उड़ान भर रहा हो। श्रीमती गांधी बड़ी प्रसन्न मुद्रा में थी। उनके विद्वतापूर्ण प्रश्नों के उत्तर मे मैंने बताया कि इस पक्षी विहार में ३२२ प्रकार के पक्षी पाये जाते हैं जिनमें से ११० प्रकार के आब्रजक अथवा पर्यटक ("माइग्रेटरी") हैं, जो टुंड्रा तक के सुदूर उत्तरी भागों से यहाँ आते हैं। १०३ प्रकार के परिन्दों ने इस पक्षी विहार को अपना प्रजनन क्षेत्र बना रखा है। पर्यटक पक्षियों में सबसे अधिक चुपका ("सेंड पाईपर") १३५ दिन यहाँ शरद ऋतु में विश्राम करता है।

सहग्रस्तित्व :

हम लोग अब छिछले पानी के सन्निकट थे जहाँ बबूल के वृक्ष पानी में उग रहे थे। इन कटिदार पेड़ों पर तो सचमुच चिड़ियों के जच्छाखाने ही नजर आने लगे; उपर से लेकर नीचे तक घोंसले ही घोंसले, कोई छोटे तो कोई बड़े, एक दूसरे से सटे हुये। सारे पेड़ पक्षियों ओर उनके चूजों की बोट से ऐसे लग रहे थे जैसे सफेदी पोत दी गई हो। एक ही पेड़ पर रंग बिरंगे जाँघिल ("पेंटेड स्टोर्क"), घोंघिले ("ओपन बिल्ड स्टोर्क"), काबुद ("ग्रेहोरन") तो बिलकुल गोरे, सफेद चार प्रकार के बगुले ("इग्रेट"), चमचे ("स्पूनबिल") और बिलकुल काले जल कौवे ("कोरमोरेन्ट") व पनडुब्बी ("डारटर") अपने नीड़ों में अपने बच्चों को पाल रहे थे। न बड़े छोटे का भेद, न काले गोरे का। यह थी सहग्रस्तित्व की साक्षात् अनुभूति।

सूर्योदय के साथ साथ पक्षियों की दुनियाँ में विशेष चहल-पहल शुरु हो गई थी। कोई माँ गले से उगल उगल कर चूजों को मछली खिला रही है तो कुछ बड़े बड़े जाँघिल के बच्चे पेड़ों के तले आकर 'आप काज महाकाज' वाली उक्ति चरितार्थ करते हुये स्वयं ही चोंच खोले हुये मछली जल में ढूँढ़ ढूँढ़ कर अपना कलेवा कर रहे थे—आलूहादित श्रीमती गांधी बोल उठीं "हम लोग ५.३० बजे ही रवाना क्यों नहीं हुये"। सारे ही चुजे अपने वयस्क माता पिता से बदसूरत थे। इस बीच मुझे लोह सारंग ("ब्लैक नेवड स्टोर्क") दिखा। इन्दिराजी ने उस ओर दूरबीन फिराई - लाल टाँगो वाला, एक मीटर से भी ऊँचा, काली चमकीली गर्दन युक्त यह पक्षी बड़ा भव्य लगा। उन्होंने देखा कि इसकी आँखें पीली थी जो मादा होने का सूचक थी। यह जल सर्व-भक्षी पक्षी हमारी नाव देखकर चमका और कुछ दूर पानी में लम्बे लम्बे डग भरता किलकारी मारते हुये, अपने काले सफेद रंगों के निरुपद्र्व की छटा बिखेरता हुआ हमारे मन में एक स्थाई सुन्दर दृश्य छोड़ गया।

साईबेरियन सारस :

हम सभी पक्षियों की हलचल देख ही रहे थे कि हमारा माँभी हुकम सिंह बोल उठा “साईबेरियन क्रेन बाईं ओर”। सभी ने एक साथ इन हिम-सम श्वेत, मूंगे जैसी लाल चोंच व टाँगो वाले जोड़े की ओर दूरबीन घुमा दी। लगभग एक मीटर ऊँचे इस जोड़े को देखते ही सब पुनर्कृत हो गये। ये ही अनुपम साईबेरियन सफेद सारस (“ग्रेट वाईट क्रेन”) तो इस पक्षी विहार की शान हैं। भारत में ये सर्दी की ऋतु में ही आते हैं और वह भी केवल भरतपुर पक्षी विहार में ही। जिज्ञासु श्रीमती गाँधी को मैंने बताया कि ये पक्षी भारत में पश्चिमी साईबेरिया स्थित, अपने प्रजनन क्षेत्र आबू नदी की घाटी से आते हैं। संसार में यह नस्ल लुप्त होने जा रही है क्योंकि कुल ३५० पक्षी समस्त विश्व में शेष रह गये हैं, जिनमें से पूर्वी साईबेरिया के लगभग २०० पक्षी तो चीन के उत्तरी भाग में सर्दी बिताते हैं। ये पक्षी बड़े सजग तथा शर्मिले होते हैं और मनुष्यों के पास पहुँचते ही उड़ कर दूर जा बैठते हैं। ज्यों ज्यों हमारी नाव उनके पास पहुँचती गई ये सहमे सहमे से दिखे और नर ने ‘टुर्र’ और मादा ने ‘टुट्ट’ करना शुरू कर दिया। नाव थामी गई पर ये धीरे धीरे पंख मारते उड़ गये। टुर्र टुट्ट टुर्र टुट्ट की मधुर बाँसुरी जैसी ध्वनि के साथ। इनके डैनों के अग्र भाग हमको काले दिखे—बड़ा सुन्दर सम्मिश्रण था काले सफेद का और उड़ान भी राजसी। दूरबीनों उनकी ओर लगी थीं और जहाँ वे पानी में बैठे, वहीं दिखा एक और जोड़ा साईबेरियन सफेद सारसों का, जिनके बीच था कुछ छोटा मटमैला सफेद रंग लिये इनका एक शिशु—ये पक्षी मृत्युपर्यन्त एक ही जोड़ा बाँधते हैं और अपने बच्चों की जी जान से रक्षा करते हैं।

छल्ला निशानी :

हमारी नाव को केवट अब क्राँचसागर क्षेत्र में ले जा रहा था। जल पक्षियों की विविध रंग-मयी दुनियाँ, उनकी हृदयंगामी क्रीड़ा यहाँ भी दृष्टिगोचर हो रही थी। जल में अनेक प्रकार की वनस्पति थी कुमदिनी, नाड़ी, ऐंठा, “अजोला” आदि। श्रीमती गाँधी ने पानी में उगते इन पौधों की जानकारी में भी उत्सुकता दिखाई। तभी हमें बड़े सूखे पेड़ पर शिकारी उकाव (“ईगल”) दिखे। एक पेड़ पर, काले परों में छोटे सफेद घब्वे लिये “लेसर स्पॉटेड ईगल” था तो पास के पेड़ पर सुनहरी गर्दन लिये “हम्पेरियल ईगल”। एक उकाव (“टोनी ईगल”) महाशय तो चिड़ियों के तीव्र में ही विराजमान थे, शायद किसी चूजे पर हाथ साफ कर चुके थे। प्रधान मंत्री ने पूछा “यह कितना खाता है”। इस बारे में वैज्ञानिक शोध का अभाव है, ऐसा डा० अली ने बताते हुये कहा कि एक घुघु (“ग्रेट होरन्ड आऊल”) एक रात में २-३ चूहे खा लेता है। मैंने भी बताया कि एक आब्रजक (“माईग्रेटरी”) पक्षी, काले सिर का धूमरा (“लार्ज-लेक हेडेड गल”) ४८ घंटे में केवल एक ही बार भोजन करता है। आब्रजक पक्षियों की बात चल पड़ी तो श्रीमती गाँधी को मैंने बताया कि डा० सलीम अली की देव रेख में बोम्बे नेचुरल हिस्ट्री सोसायटी के तत्वाधान में, इसी पक्षी विहार में ७०,००० पक्षियों को छले (“बर्ड रिगिंग”) पहनाये जा चुके हैं जो २५६ प्रकार के पक्षियों की जाति के हैं। एक थाईवाला (“रफ एण्ड रीव”) पक्षी, जिसे भरतपुर में अलुमिनियम का छल्ला (रिंग) पहनाया गया था, वह रूस के याकूशियन क्षेत्र में ५,८५० किलो मीटर की दूरी पर पकड़ा गया।

जो सुना वही पाया :

प्रधान मंत्री के अनेकों बुद्धिपूर्ण प्रश्नों के उत्तर देते देते अब हम लोग उसी स्थान पर आ गये जहाँ हमें नाव से उतरना था। केवट ने घाट पर नाव लगाई तो मैंने श्रीमती गाँधी से उतरने का निवेदन किया। सौम्य मुद्रा में मुस्कान के साथ बोली “रास्ते में आप हैं पहले आप लोग उतरिये”। नाव की एक घंटे की यात्रा बड़ी रोमांचकारी और स्फूर्तिदायक थी और हर्ष से भरी श्रीमती गाँधी ने उतरते ही संक्षेप में कहा “जो सुना वही पाया”।

शान्तिकुटीर :

लौटने पर एक हरे 'लोग केबिन' के पास आते ही श्रीमती गांधी ने पूछा "ये क्या है ?"—"फोरेस्ट रेस्ट हाउस-शान्तिकुटीर" मेरा उत्तर था। स्पष्टवक्ता इन्दिराजी एक दम कह उठीं—"यह हरे भरे वन के वातावरण में कैसा मिल रहा है। मुझे यहाँ क्यों नहीं ठहराया गया ?" प्रकृति प्रेम का उदाहरण ही तो था यह कथन।

"फोरेस्ट लाज" में वापिस आ, कुछ देर बाद सभी एक बार पुनः अभयारण्य को रवाना हुये। इस बार केवल मिनी बस से ही भ्रमण किया।

सुन्दर सुखाब:

मार्ग में भूरी सात बहनें ("बेबलर"), काली मोती सी लाल आंखों वाला कूका ("क्रो फेजेन्ट"), चहकती हुई बुलबुल ("रेड वेटेड बुलबुल"), शान्ति की प्रतीक फास्ता ("डब"), गोरैया ("स्पेरो"), फुदकी ("वाब्लर") तथा तटीय पक्षी ("बेडेरस") को देखते हुये हम धीरे धीरे सापनमोरी पर पहुँच गये। मोड़ पर गाड़ी रुकी तो एक किलकला ("वाइट ब्रेस्टेड किंगफिशर") मेंड पर उगे एक बबूल वृक्ष की टहनी पर बैठा दिखा। ज्योंही ये जोर से आवाज करता उड़ा, हमने अपने चमकते नीले कस्थई पैरों की सुन्दरता से हमारा मन मोह लिया। हमारे ऊपर अबाबील ("स्वेलो") उड़ रही थी तो जल में एक सर्प-ग्रीवा-सम पनडुब्बी ("स्नेक बर्ड") मछली पकड़ हवा में उछाल कर सीधा निगलने का प्रयास कर रही थी। अपनी 'दादी' के पास बैठे राहुलजी का ध्यान तत्काल इस ओर उम्होंने खींचा। सभी उत्कण्ठा से ये प्रक्रिया देख रहे थे कि पास में ही पंडित जी की तरह माथे पर पीला टीका लगाये पीसन ("विजीयन") तैरते दिखे—इतनी सुन्दर रंग बिरंगी वस्तु। सृष्टि निर्माता की कलात्मक प्रवृत्ति की दाद दिये बिना नहीं रहा जा सकता।

"माऊंड प्लांटेशन" में ही, जहाँ अन्य जलपक्षी थे, वहाँ चैतवा ("गारगनी टोल") व चैती ("कोमन टोल") पानी पर दाना चुगती हुईं दिखीं। सड़क पर, गले में काला 'बिब' पहने चौकन्नी टीटोंड़ी ("रेडवाटल्ड लेपविंग") उच्च स्वर में हमारे आगमन पर अपनी सहेलियों को सचेत कर रही थी। गाड़ी के पास आते ही लम्बे काबुद ("ग्रेहेरोन"), अंधा बुगला ("पोंड हेरोन") तथा अन्य जल पक्षी एक कर्कश स्वर करते हुये उड़ दिये। चहुँ ओर पक्षी ही पक्षी, विशेषतौर से कल हंसों की कां कां और उनकी गुलाबी चोंच बड़ी लुभावनी थी। दूरबीन लगाये हम देख रहे थे कि फिर पानी में से जड़ें निकालते इन्डो साईबेरियन क्रेन के जोड़े मय अपने बच्चों के कोई २०० वर्ग मीटर क्षेत्र में फैले दीख पड़े। तभी पास में ही एक भगवा रंग लिये सुखाब ("ब्राह्मणी डक या रड़ी शैलड्रेक") के जोड़े पर दृष्टि पड़ी।

"सुखाब के पर" कहावत प्रसिद्ध ही है। इसकी काली चोंच, बाढामी गर्दन, गले में हरी कँठी और चमकती हरी काली पूँछ सारे नारंगी बदन पर बड़ी फब रही थी। यही तो थे अपने साहित्य के बहुचर्चित चकवा चकवी या चक्रवाक जो निशा के अंधकार आते ही आपस में तड़पते तड़पते क्वाँक क्वाँक करते रहते हैं। इन्हें सबने खूब देखा और इन सुहावने पक्षियों ने भी चारों ओर घूम फिर कर अपने रंगों की छटा हमें अच्छी तरह दिखाई।

आसामी पर्यटक :

हमारे बाईं ओर, एक सलेटी बड़ी विशाल चौंच वाले, “लेफ्ट राइट लेफ्ट राइट” करते हुये महावक (“अडजुटेड स्टोर्क”) महादय थे। जब मैंने कहा कि यह अभी जल्दी आ गया है और शायद कल ही आपके स्वागत के लिये आया है तो मेरे शब्द हंसी के ठहाकों में ही डूब गये—श्रीमती गांधी ने आखिर पूछ ही लिया “ये आसाम बंगाल से यहाँ क्यों आते हैं जब कि वहाँ ही इनका भोजन पर्याप्त है”। मैंने उत्तर दिया कि पक्षी अपने प्रजनन स्थान नहीं बदलते पर भोजन प्राप्त करने के स्थान में परिवर्तन करते रहते हैं और जब गर्मी में यहाँ पानी सूख जाता है तो इन्हें खाने को असंख्य मात्रा में मछली मिल जाती है। तदनन्तर ये यहाँ से वर्षा के आगमन के साथ ही पुनः पूर्व दिशा में कूच कर देते हैं।

बाल्मीकि के कौंच पक्षी :

हम जल प्लावित चकवा चकवी व बकाल्य क्षेत्र को पार कर ही रहे थे कि सड़क के पास ही हलके मटमैले कथई रंग का एक सूखा ठूँठ सा दिखा, निकट आये तो इसमें हलचल हुई तो मालूम पड़ा ये अर्जुन (“परपल हेरोन”) पक्षी महाशय थे जो बगला भगत की तरह मछली की घात में ध्यान मग्न थे। रास्ते में नीलकंठ (“ब्ल्यू जे”), सफेद काली अबलक मैना (“पाइड मैना”) आदि देखते हुये जलविहार के निकट आये तो यहाँ आदिकवि बाल्मीकि के क्राँच पक्षी (“सारस क्रेन”) युगल ने अपने दो शिशु सहित हमें दर्शन दिये। यही पक्षी भारत का सबसे बड़ा १.५ मीटर ऊँचा पक्षी है। आसमानी बदन लिये इसकी लाल गर्दन व टाँगें बड़ी मनमोहक होती हैं। इनका प्रणयगान विश्वप्रसिद्ध है तथा इनका दाम्पत्य प्रेम तो अनुपम है, अनुकरणीय है। इसी पक्षी की विरह वेदना देखकर ही तो बाल्मीकि के मुख से संस्कृत की प्रथम कविता का उद्भव हुआ था—

“मां निषाद । प्रतिष्ठाम् त्वम् अगमः शाश्वती समां:

यत क्राँच मिथुनादेकम् अवधि काम मोहिताम् ॥

अर्थात् “हे निषाद । तुमने कामरत क्राँच युगल में से एक का वध कर दिया है अतः इस युग में और आने वाले युगों में तुम्हें कभी प्रतिष्ठा प्राप्त न हो”।

कसाई चिड़िया :

सड़क पार करते तीतर (“ग्रे पारट्रीज”) दिखे तो पेड़ों पर बया के कलात्मक लटकते हुये घोंसले। मृगताल में घुसते ही सियार दिखा। राहुलजी को श्रीमती गांधी ने इस धूर्त पशु की चालाकी की बात बताई जो सभी से तालमेल बैठकर अपना उल्लू साधता रहता है। हम चीतल वन में घुस ही रहे थे कि पेड़ों पर काला घोला सफेद लहोतरा (“ग्रेट ग्रे स्लाइक”) तथा गहरी लाल कथई पीठ वाला छोटा लहोतरा (“वे वेकड स्लाइक”) दोख पड़े - पास ही इस डाली से उस डाली पर फुदकती भूरे रंग की, चौंच से ले आँखों तक गहरी काली काजल की पट्टी लिये, कसाई चिड़िया (“रुपस वेकड स्लाइक”) देखते ही प्रधान मंत्री ने इसकी सूली पर लटका कर शिकार को खाने वाली आदत समझाई। गायन निपुण चन्डूल (“क्रेटेड लार्क”) तथा गहरा लालिमा लिये कथई पूँछ वाले दियोरा (“रुपस टेलड पिच लार्क”) भी हमें दिखे।

चीतल वन :

हम घने बेर, कीकर, माखी के जंगल से निकल रहे थे जहाँ हमारा वन्य पशुओं से साक्षात्कार हुआ। एक ओर वन गायों का झुंड दिखा तो दूसरी ओर शानदार भीमकाय नीले काले रंग का नर रोज ("ब्ल्यू बुल" या नील गाय) - बया भव्य दृश्य था। ये पशु हमारी ओर यों देख रहा था कि मानो कह रहा हो कि "हमारे क्षेत्र में प्रवेश कैसे किया"। यह निर्भय स्वतंत्र पशु हमसे जरा भी नहीं डरा। कुछ ही क्षणों में भोले चीतल, अंगड़ाई लेते हुये, मानो हमें देख, प्रणाम करने खड़े हो गये। गाड़ी आगे बढ़ती गई और एक नहीं, दो नहीं, सैकड़ों चीतलों ("स्पॉटेड डीयर"), नील गायों ने हमें कृतार्थ कर दिया। छँ शाखों में विभक्त सींग वाले नर चीतल व उनकी सींग रहित निश्छल मादा व शावक वृद्ध हमारी ओर धीरे धीरे झाड़ियों से निकल कर अपने सुनहरे कस्थई शरीर में रजतसम श्वेत बुंदवियों से हमें लालायित कर रहे थे। कितना प्यारा स्थायी शांति देयक दृश्य था "जो देखे वो ही पाये"। उधर रोजों ने भी अपनी भूरे रंग वाली मादाओं और शावकों के साथ हमें बढ़ा संतोष दिया, पर एक नर रोज बड़ा ही असभ्य निकला। हमारी ओर पीठ कर, उसने दीर्घशंका निवारण शुरू कर दी - संक्षेप में कहा जा सकता है कि इस अभयारण्य में पशु एकदम निडर थे और उन्होंने मानवों से सामंजस्य स्थापित कर लिया था।

शिला लेख :

टेड़ी मेड़ी, सकड़ी सड़कों पर जिनके दोनों ओर वृक्षों की कतार थी हम 'पाईथन पोइन्ट' होते हुये, हँस सरोवर में नीली देह पर लाल चोंच वाला क्लीम ("परपल मूरहेन"), लम्बी ऊँगलियों वाला पीहो (जैकाना), सफेद काला कोडियाला किलकिला ("पाइड किंग फिशर") एवं अन्य पक्षियों के समूह देखते हुये जब केवलादेव शिव मन्दिर के पास पहुँचे तो मानसरोवर के पास लगे विशाल शिलालेख को देखकर एक बार फिर गाड़ी रुकवाई गई। इस पर १९०२ से १९६४ तक हुये मुर्गावियों के शिकार का विवरण अंकित था। १२ नवम्बर १९३८ को जब तत्कालीन वायसराय लार्ड लिनलिथगो को ४२७३ बतखें एक ही दिवस में मारने की संख्या पढ़ी तो श्रीमती गाँधी के मुख पर रत्नानि झलक रही थी और उन्होंने पूछा "यह सेन्चुरी कब बनी" - १९५६ में, मेरा उत्तर था तो फिर उनके आगे के शिकार लेख के पढ़ते ही मैं ताड़ गया कि वे कहना चाहती हैं कि फिर इसमें शिकार क्यों कर हुये। उन्हें मैंने बताया कि यद्यपि यह अभयारण्य बन गया था किन्तु भरतपुर के भूतपूर्व महाराजा के जब तक शिकार के अधिकार संविधान में संशोधन द्वारा समाप्त नहीं हुये थे "डक शूट" (मुर्गाबी का शिकार) बदस्तूर चालू रहा और अब बन्द है।

राज हँस :

निर्धारित समय से हम लगभग ५० मिनट विलम्बित हो चुके थे फिर भी मैंने पूछा कि क्या आप राजहँस देखना चाहेंगे? स्वीकृति मिलते ही हम उस ओर चल पड़े - मार्ग में चोंच पर नारंगी बिन्दु लिये गुमराल ("स्पॉटाबिल") भी हमें दिखे - राजहँस ("बार हेडेड गीज" के वृद्ध भुँड को देखते ही उन्होंने दूरबीन आँखों पर लगाकर कहा कि सफेद हलके भूरे रंग मिश्रित पंरों वाले इन हँसों के सिर पर तीन गहरी हरी काली धारी थी। डा० अली ने बताया "ये हिमालय से परे मानसरोवर के तटों पर प्रजनन करते हैं और वो स्वयं इसका अध्ययन करने इस वर्ष वहाँ जाने वाले हैं"।

वापसी में, मार्ग में जब डा० अली ने मेरे द्वारा लिखित नवीनतम पुस्तक 'ए स्टेडी आफ फ्लोरा एण्ड फोना आफ भरतपुर सेन्चुरी' उन्हें गाड़ी में भेंट की तो तत्काल उन्होंने मुझे बधाई दे, कृतार्थ कर दिया।

सुखद रोमांचकारी अनुभव :

इस प्रकार हम पशु पक्षियों से मिलकर समय से १ घंटा ७ मिनट देर पुनः 'फोरेस्ट लाज' पर १०.५२ पर आ गये जहाँ संशयमिश्रित भावना से मंत्रीगण, अधिकारी वर्ग हमारी बाट जोह रहे थे—श्रीमती गाँधी को देखकर मुझे यह सफाई देने की जरूरत ही नहीं पड़ी कि यात्रा बड़ी अच्छी व सफल रही। प्रधान मंत्री ने प्रसन्नमुद्रा सेंकचुरी रजिस्टर में रिमांक लिखे "एक सुखद एवं शान्तिपूर्ण अनुभव जो हमारे साथ डा० सालिम अली की उपस्थिति से और भी रोचक व सूचना प्रेरक हो गया। मैं आशा करती हूँ कि अभयारण्य के मध्य में जो सड़क बसें व शोर लाती हूँ उसके बारे में कदम उठाये जावेंगे"।

सभी जीवों से प्रेम :

लगभग ३½ घंटे सेंकचुरी में प्रधान मंत्री के साथ रहने का प्रेरणादेयक क्षणों का जब मैंने चित्तन किया तो आभास हुआ कि हमने लगभग ८५ प्रकार के पक्षी देखे जिसमें लगभग ५० तो श्रीमती गाँधी ने स्वयं ही पहचाने होंगे। उन्होंने कितना सच कहा था "हम गाय को गऊ माता तो कहते हैं पर उसकी दृष्टि दूर करने को कुछ नहीं करते"। श्रीमती गाँधी के "सेंकचुरीज में, आलीशान, भड़कीले रंग वाले ऊँचे ऊँचे भवन नहीं होने चाहिये, मांसाहारी पशुओं को जीवत पशुओं की "बेट" (बलि) पर प्रतिबन्ध होना चाहिये तथा चमकीले रंग बिरंगे वस्त्र पहन कर 'ट्रान्जिस्टर' बजाते हुये आगन्तुक निषेधित होना चाहिये' निश्चय ही वन्य जीव प्रबंध के लिये मार्गदर्शक निर्देश हैं। मैंने यह भी अहसास किया कि प्रधान मंत्री श्रीमती गाँधी मानव के अधिकारों के लिये ही जागरूक नहीं है किन्तु उनके हृदय में भोले भाले निरीह पशु पक्षी ही नहीं मूक पेड़ों पौधों की रक्षा एवं वर्धन के लिये भी असीम कसक है।

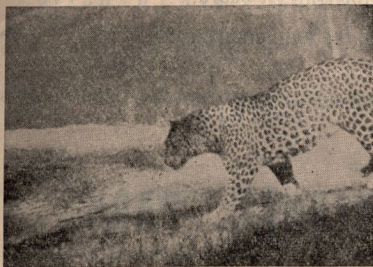
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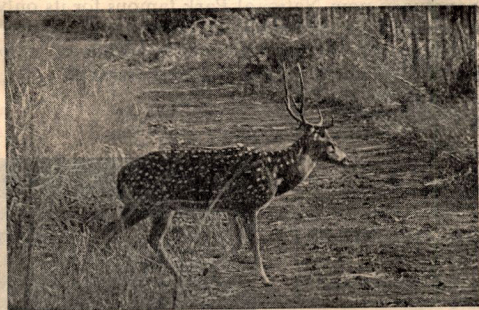


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- (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.
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